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## AGRICULTURAL MARKETING IN INDIA



### REPORT ON THE MARKETING OF MILK IN THE INDIAN UNION

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## PREFACE.

The " Report on the Marketing of Milk in India and Burma " was first issued in 1940 and it helped to focus attention on "the deplorable state of affairs existing in the milk trade of the country ". The report had an excellent reception from municipalities, members of the trade, producers' organisations, Governments and the general public and all the copies were sold out within the first few months of its publication. A revised edition of the report was issued in July 1942 and it was also soon sold out.

Several changes have taken place in the country since that time. It is admitted that the production of milk has not kept pace with the increase in human population and urban areas have been experiencing acute shortages of milk with high prices. Central, Provincial and State Governments have been devoting particular attention, during the past five years, for improving the milk supply in urban areas by organising co-operative societies and other measures. The partitioning of the country in August 1947 and the political changes in its wake have also necessitated a re-examination of the Indian Union's resources for milk production with a view to devising steps for increasing production and improving conditions of distribution of this essential article of food.

The report has, therefore, been completely revised and re-written incorporating information on recent developments and statistical data collected during the 1945 Cattle Census\*.

This revision has become possible because of the active co-operation of Provincial and State Marketing Staff who supplied as much data and information on the subject as they possibly could. Thanks are due to them.

Thanks and acknowledgments are also due to a large number of producers, milk collectors, merchants, dairy-owners, Provincial, State and Central Government Departments and others who

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\*An unpriced " Brochure on the Marketing of Milk in the Indian Union " was issued in January|March 1949 giving the salient information in the report, after the manuscript had been sent to the Press.

**kindly** extended active assistance and co-operation in carrying out the survey.

Any suggestions for improving the scope and utility of the report or for implementing the suggestions made therein for improvement would be welcome and would receive careful consideration.

The Government of India should not be regarded as assuming responsibility for any statements contained in the report.

Ministry of Agriculture,  
Directorate of Marketing & Inspection,  
Government of India,  
New Delhi.

DECEMBER, 1948.



## CHAPTER I.—SUPPLY.

### A.—Production.

Keeping and breeding of milch cattle is the most ancient of agricultural pursuits in India. Perhaps in no other country of the world are cattle needed so vitally for the products they yield while living and which they leave behind after they die a natural death, to supplement the vegetarian dietary and other requirements of the people with milk and its products and for supplying the huge amount of bullock power required to carry on its main occupation, *viz.*, agriculture.

Cows and she-buffaloes constitute the primary source of market milk. Goats are numerous and widely distributed. Many of them are hand-milked but the supply of fresh milk from this source is commercially unimportant. A few sheep, asses and camels are also hand-milked but the quantity of their milk available for sale is negligible.

#### (1) NUMBER OF MILCH ANIMALS.

The first all-India census of livestock was taken in the cold weather of 1919-20 and since then a census has been undertaken at the end of each succeeding quinquennium. In the fourth census of 1935, two provinces, Bengal and Bihar and Orissa (which then formed one province), did not participate owing to financial reasons, and at the fifth census, held in 1940, the United Provinces and Orissa (newly constituted a province in 1936) did not take part owing to the need for economy arising out of the War. The figures of the Indian States are incomplete, for, although the number of States participating was progressively increasing, the livestock in about 21 per cent. of the total area was not enumerated at the census of 1940. In order to have as complete a picture as possible for the areas not covered by the 1940 census, estimates of the number of cattle have been made on the basis of the preceding census and changes shown by 1940\* census in other provinces. The sixth census† was taken in 1945\* and all provinces and almost all the Indian States participated in it.

Cows and she-buffaloes are recorded under three sub-groups, *viz.*, (i) breeding females, *i.e.*, females over three years kept for breeding or milk production, (ii) females over three years used for work and (iii) females over three years not in use for work or breeding purposes, in the statements prepared for the 1940 and 1945 census reports. In the case of goats, sheep and asses, the census returns according to age or sex groups are available only since 1940. So far, only the total figure is ascertained in case of camels.

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\* Figures relating to Pakistan have been separated and population of milch cattle in the Indian Union according to recent administrative groupings has been estimated. For comparison, figures recorded during the 1940 census have also been estimated for the Indian Union.

† The report of this census has not yet been published.

(a) *Milch cattle*.—The number of milch cows and buffaloes in the Indian Union during 1940 and 1945 is as given in the table below :—

*Number and percentage of milch cows and she-buffaloes.*

	1940		1945	
	Number in lakhs.	Percentage to Total.	Number in lakhs.	Percentage to Total.
Cows .. .. .	407.38	68.9	411.01	67.7
She-buffaloes .. .. .	183.56	31.1	195.72	32.3
Total .. .. .	590.94	(100.0)	606.73	(100.0)

It seems apparent that the population of both cows and buffaloes increased from the year 1940 to 1945, the rate of increase being slightly greater in the case of she-buffaloes. It may, however, be mentioned that the 1945 census was more comprehensive than that of 1940, and as such the apparent increase in 1945 cannot be taken as an absolute rise in the population of cows and she-buffaloes.

(b) *Goats, sheep, asses and camels*.—The number of animals in the Indian Union was as under :—

*Number of goats, sheep, asses and camels.*

	Pre-partitioned India (1940)	Indian Union (1945)
	(Lakhs)	(Lakhs)
Goats .. .. .	620.20	466.73
Sheep .. .. .	451.10	397.79
Asses .. .. .	16.80	11.42
Camels .. .. .	9.60	6.61



(c) *Place of the Indian Union in the world's total cattle population.*—Indian Union has a huge cattle population as is seen from the table below :—

*World's cattle population.*  
(1945)

	Number of cattle.	Number of buffaloes.	Total.
	(Millions)	(Millions)	(Millions)
In reporting countries of the world* (including the Indian Union .. .. .)	544	70	614
Indian Union .. .. .	140	42	182
Percentage in the Indian Union .. .. .	25.9	60	29.8

Indian Union thus possess more than a fourth of the world's recorded population which includes cows, she-buffaloes, bulls, bullocks, young stock and calves.

(2) *NUMBER OF MILCH ANIMALS KEPT IN URBAN AREAS.*

Absence of adequate facilities for long distance transport of milk in commercial quantities, the warm climate of the country which is detrimental to the keeping quality of raw milk, increased possibilities of adulteration in rural supplies and the economic scruples of the people, partly religious, are responsible to a considerable extent for encouraging the production of milk "on the spot" in urban areas so as to be as near as possible to the place of consumption. For instance, during 1945, it was ascertained that 54,400, 15,400 and 60,500 milch animals were being maintained in congested stables and houses in the cities of Calcutta, Madras and Bombay respectively for meeting the fluid milk requirements of those cities, but only partially. This is almost universal for all urban areas, but difficulties in getting good milk of reliable quality in towns and cities are so real and serious that some well-to-do persons always try to keep their own animals for milk purposes. This is the case when there are young children in the family and special importance is attached to the timely supply and quality of fresh milk and above all, when the family can afford to keep animals for this purpose. Their number is insignificant.

\* Year book of Food and Agricultural Statistics—1947 (F.A.O.).

### (3) MILK YIELDS AND ANNUAL PRODUCTION OF MILK.

(a) *Recording of yields.*—A satisfactory method of estimating the annual yield of milk for animals in different parts of the country would be to examine the milk yield records of a large number of village cows and she buffaloes over a long period. Such records, unfortunately, are not available. There are only a few reliable farm records of milk yields, compared with the vast number of cattle in the country. This is due to the fact that milk recording is only practised at the Government farms (civil and military) and at a few private farms. Of approximately 607 lakh three-year old milch cows and buffaloes, it appears that only about 20,000 animals are individually recorded. To this may be added about half of the 58,000 she-buffaloes kept in Bombay city and suburban areas where such records of individual animals may be available from owners of these animals. Thus, individual or collective records of only about 50,000 cattle or less than 0.08 per cent. of the total milch cattle in the Indian Union can be depended upon to some extent in estimating the milk yields on a more rational basis.

A majority of the recorded animals are usually the best specimens of well-known dairy breeds and some of them, particularly on the Government farms, have pedigrees extending over several generations. The controlled farm conditions under which these animals are maintained are also greatly different from the village conditions under which most cattle are kept. For these reasons, the available records cannot be taken to represent in general the cattle of the country and they could only be used to indicate the dairying potentialities of the Indian cattle in response to proper breeding, feeding and management.

(b) *The Village Enquiry.*—A rapid enquiry in certain areas was undertaken by the Indian Council of Agricultural Research. It commenced in September 1936 and lasted for five months in seven cattle breeding tracts, viz., (i) the Montgomery and (ii) the Haryana tracts of the Punjab, (iii) the Kosi tract in the United Provinces, (iv) the Kankrej tract in Bombay Province, (v) the Ongole tract in Madras Province, (vi) the deltaic tract in Bihar and (vii) the Malvi area in the Central India. These areas were chosen because of their dairying nature and because working bullocks were also bred there.

For collecting the data, 20 holdings were selected at random in each of 370 villages, also chosen at random in the seven tracts. Milk of approximately 6,160 she-buffaloes and 4,310 cows was recorded for a period of seven consecutive days. Based on a week's recording, approxi-

\*Report on a Village Enquiry regarding Cattle and Production and Consumption of Milk in seven Breeding Tracts of India (1939).

mate stage and average length of lactation as estimated by the producers, the daily and lactational yields were computed as under :—

*Village enquiry results on milk yields.*

Tract.	Cows			She-buffaloes		
	Milk yield per day.	Length of lactation.	Lactational yield.	Milk yield per day.	Length of lactation.	Lactational yield.
	(lb.)	(Months)	(lb.)	(lb.)	(Months)	(lb.)
Montgomery ..	4.72	10.43	1,344	8.24	11.24	2,470
Haryana .. ..	4.46	7.62	986	11.21	8.65	2,575
Kosi .. ..	3.89	8.25	865	7.06	9.29	1,768
Delta (Bihar) ..	2.74	8.14	651	5.46	8.82	1,256
Malvi (C. P.) ..	1.67	8.94	411	5.44	10.41	1,513
Kankrej .. ..	3.90	7.90	920	7.97	9.14	1,890
Oagole .. ..	4.64	9.54	1,238	6.53	11.30	1,933
Average .. ..	3.74	8.81	943	7.82	9.98	2,160

As the tracts are not even representative of the provinces in which they are situated, the report stresses the fact that it would be incorrect to generalise upon the results obtained or to regard them as applicable to India as a whole.

(c) *Farm records of milk yields.*—Reliable records of the more farms give more milk in their subsequent lactations. The first progeny farms, are reproduced in the following table :—

*Yields of hand-drawn\* milk on certain Government† and private farms.‡*

Name of breed.	Purchased stock		Farm bred stock	
	No. of lactations averaged.	Yield per lactation.	No. of lactations averaged.	Yield per lactation.
		(lb.)		(lb.)
Deoni	5	2,943	2	2,672
Gir	5	2,753	..	..
Hariana	36	3,400	101	3,459
Kankrej	2	3,407	54	3,232
Krishna Valley	11	2,595	..	..
Malvi	4	2,863	4	2,469
Ongole	..	..	10	2,938
Sahiwal—				
(a) All types	65	3,735	127	4,269
(b) At Ferozepur Farm	..	..	901	5,717
Sindhi—				
(a) All types	15	3,534	85	3,664
(b) At Military dairies§	100	4,150	..	..
Tharparkar	44	3,438	89	4,056
Buffalo.				
Murrah—				
(a) All types	35	4,427	97	4,113
(b) Military dairies (Northern Circle)§	861	3,771	..	..
(c) Military dairies (Southern Circle)§	228	4,230	262	4,643
Nili	2	5,212	..	..
Surti	5	3,576	4	4,259

\* The quantity actually drawn in the pail, i.e., excluding the quantity sucked by the calf.

† The following milk performances have been recorded in Government Cattle farms in the Madras Province during 1946-47 :—

Scindhi herd .. 11.5 lb. per cow in milk and 5.8 lb. herd average.  
 Kangayam herd .. 4.5 lb. per cow in milk and 1.5 lb. herd average.  
 Hallikar herd .. 2.8 lb. per cow in milk and 1.4 lb. herd average.  
 Cross-bred .. 8.0 lb. per cow in milk and 5.3 lb. herd average.  
 Ongole herd .. 8.3 lb. per cow.  
 Buffalo herd .. 11.4 lb. per animal.

‡ Indian Council of Agricultural Research, Miscellaneous Bulletin No. 18, (1938).

§ These records are from other publications of the Indian Council of Agricultural Research, and generally represent records of weaned animals which is a common practice at the Military dairies.

The record in the preceding table may be studied together with Appendices I and II wherein the yields of cows and she-buffaloes in different areas are given. The figures in the appendices relate to the average yield of all three old cows and she-buffaloes kept for breeding or production of milk and include heifers and such cows which for some reason or other may not calve during the year and may give no milk at all.

(d) *Methods adopted for quoting milk yields and computing production.*—There are several ways of judging milk yield of animals, the more common being : (i) average milk yield per day, (ii) lactational yield and (iii) annual yield per animal in milk. These methods must, however, be supplemented with some more information before they can give any indication of the quality of cattle. For instance, the figure of average milk yield per day is of little value unless the length of lactation is also known. Indeed, the figure by itself may even be misleading, for an animal with an apparently small average yield per day but a longer milking period may during the lactation give much more milk than an animal with a higher daily yield but with only a short lactation. Similarly, with the lactational yields, the length of lactation is important. In some of the countries, in order to give this figure a comparative value, all the lactational yields are given on the basis of a lactation of 300 days. The annual yield per animal in milk seems to be more dependable method for indicating fairly well the performance of any milk animal. However, for computing the total production of milk according to any of the above three methods it would be essential to know the proportion of the animals that calve annually and remain in milk.

One or more of the above methods were employed, in accordance with information and data available locally, in computing the production of milk in each area of the country as shown in Appendices I and II. In arriving at these figures, percentage of animals that calve annually, interval between calvings, length of lactation and yield per lactation, were all taken into account. In some of the areas, e.g., Rajputana, where greater attention is paid to the rearing of male calves, some cows are partially milked or some are not milked at all. This fact was also considered in estimating the production. It may be mentioned here that the figures represent the quantities actually drawn into the pail and exclude the portion taken by the calf directly from the udder.

In order that the yields in different areas may be comparable, they have been adjusted on the basis of annual milk yield per animal for all the three-year old cows and she-buffaloes kept for breeding or production of milk. This grouping has been adopted to fit in the classification followed in the cattle census returns.

(e) *Annual milk yield per cow.*—The estimated annual yields of hand-milked milk per cow in the different areas are given in Appendix I. It will be observed that these vary from 65 lb. per annum in the Central Provinces and Vindhya Pradesh to about 1,445 lb. per annum in East Punjab with an average of 413 lb. for the whole of the Indian

Union. This works out to 1 lb. 2 oz. of milk per day per animal on an annual basis or nearly 2 lb. per day if the yield is taken on the basis of an average lactation of about 210 days.

It is generally observed that in the north and west the cows are better milkers, but as one proceeds to the south and east, the milk producing capacity falls.

(f) *Localisation of cow milk production.*—The map opposite page 8 illustrates that the production of cow's milk is generally concentrated in the Indo-gangetic plains and Eastern Rajputana. Of all the areas, the United Provinces produce the largest volume of cow's milk and contributes 20.3 per cent. of the total production of cow's milk in the Indian Union. Madras Province stands second with 13.5 per cent. to its credit. Bihar with 10.8 per cent. East Punjab with 9.1 per cent. West Bengal with 7.1 per cent. and Rajasthan with 5.4 per cent., are the other important cow milk producing areas.

(g) *Annual milk yield per she-buffalo.*—The estimates for the different areas are given in Appendix II and a comparison with those for cows shows that in almost all areas, the she-buffalo is the better milker of the two. Enquiries indicate that as they yield richer milk, which gives a better outturn of milk products, the she-buffaloes are better, fed and looked after than the cows. In fact, it is said that unless a buffalo is well fed, she will refuse to do her best at the pail, whereas a cow would continue to yield the usual quantity of milk without much special attention.

She-buffaloes do not thrive well in the hilly tracts or where nutritious fodder is not available. This accounts for the low milk yields in Vindhya Pradesh (445 lb. per annum), Kashmir (570 lb.) and Assam (315 lb.). The best buffaloes are in Saurashtra where the average milk yield is 2,500 lb. per annum equivalent to about 7 lb. per day throughout the year. The number of such animals is, however, small and is only about 3.74 lakhs. East Punjab has the largest number (13.9 lakhs) of high yielding animals, which are estimated to give about 2,320 lb. of milk per animal per annum. The average yield per she-buffalo per annum for the Indian Union is 1,101 lb. or more than two and a half times that of cows.

(h) *Localisation of buffalo milk production.*—From the map facing this page it will be seen that the production of buffalo milk is also concentrated in the Indo-gangetic plain, excluding Bengal. Detailed figures given in Appendix II will indicate that the United Provinces produce 26.0 per cent. of the total buffalo milk of the Indian Union, followed by East Punjab with 15 per cent. West Bengal which produces 7.1 per cent. of the Indian Union's total of cow's milk, contributes only 0.6 per cent. to the total production of buffalo milk.

(i) *Comparison between the number of milch cattle and production of milk in the different areas.*—Since the milk yields of cows and she buffaloes vary widely in the different areas, the concentration of mere cattle numbers is no index of production of milk in any area. The

diagram facing this page very clearly illustrates this fact. East Punjab with about one-fourth the number of milch animals of the United Provinces, produces more than one-half of the total milk produced in the latter province. West Bengal has more milch cattle than East Punjab but her milk production is only about a-fourth of that in the East Punjab. The population of milch cattle in Madras Province is nearly 80 per cent. of that of the United Provinces but she produces just one-half of what is available in the latter province. It will also be seen that although she-buffaloes are generally less in number than cows, they contribute much more to the production of milk. For instance, in the Central Provinces, the number of she-buffaloes is only about one-fourth of the total milch cows, but they yield approximately double the quantity of milk given by all the cows.

(j) *Annual milk yield per goat and localisation of goat milk production*—As previously mentioned, the cattle census held since 1940 classifies goats into age and sex groups. However, no indication is given about the number which are milked. About 467 lakhs of goats of all ages and both sexes are reported as existing in the Indian Union. Of these the enquiries show that 81.73 lakhs or 17.5 per cent. are hand-milked.

Except for a small flock at the Mission Farm, Etah (United Provinces), and at the Government Cattle Breeding Farm, Hissar (East Punjab), practically no scientific study is made on the keeping and breeding of goats and, therefore, very few records of milk yields are available. At the Etah farm, the annual yield (1941) of selected goats of "Jamna Pari" and "Bar Bari" breeds is 489 and 359 lb. respectively for a lactation of about 150 days. These records\* are of farm-bred selected goats kept and fed under farm conditions and represent only about 40 goats of each breed. At Hissar farm also, several goats have given yields above 400 lb., 7 goats have given over 700 lb., while one has given 1 000 lb. of milk in one lactation.

Under village conditions, however, the goats are seldom stall-fed and have to depend upon grazing and leaves of trees and shrubs. Sometimes, the village goats have to roam far afield during the day in search of food and water and on account of their nibbling habit there are certain restrictions to their grazing in forest areas. Few ever get any grain and that only, if they are kept in the urban areas for supply of milk. It is, therefore, creditable that even under such adverse conditions the reported average yield in various areas of the Indian Union is fairly good. The estimate of 134 lb. of milk per annum for milking goat relates to a population of about 82 lakhs. This works out to about 1 lb. of milk per day assuming that the average length of lactation is about 150 days.

This fact together with the results obtained at Etah and Hissar indicates the possibilities of putting more milk in the goat through

\* Progress report of the Scheme for the Improvement of Goats in the United Provinces at the Goat Breeding Farm, Etah, for the year 1940-41.

selective breeding and feeding. It calls for the attention of the Animal Husbandry Departments to examine the question of goat improvement in their areas, particularly where it may not be desirable to increase the number of cows or she-buffaloes.

Appendix III deals with the yield\* of milk per goat in the different areas. In some of them, goat milk has no market importance at present and accordingly no estimates are made regarding their performance. It is noticed that goats from the East Punjab and Bihar are particularly heavy milkers. For instance, the average goat of the East Punjab yields 440 lb. of milk.

Some goats give two kids at a time and a few may kid twice a year and have two lactations. Kidding twice a year is said to have an adverse effect on their stamina and also on that of the kids. The estimated yields should be taken to represent the annual average yields generally obtained during one lactation.

In the production of goat's milk, East Punjab tops the list and produces 13.3 per cent. The United Provinces contribute 13.1 per cent. whereas Madras Province, Rajasthan and Saurashtra produce 9.1, 5.9 and 5.3 per cent. respectively.

(k) *Annual milk yield per sheep, ass and camel.*—(i) *Sheep.*—It is indicated that sheep are generally not milked and are mostly kept for wool and meat. If the ewes are milked, the quantity and quality of wool as well as the growth of the lamb are said to suffer. The capacity of sheep to yield milk is estimated to be much less than that of the goat and is generally sufficient only for the lambs.

(ii) *Ass.*—The milk of an ass has a market value only in exceptional cases for the feeding of infants, under medical advice. In the Nawanagar where there is a large number of donkeys, it is reported by the breeders that some of the donkeys give as much milk as a goat and that it is frequently sold. For Saurashtra and Cutch, the estimated lactational yield of a goat is about 200 lb. and this may be taken as a rough indication of the milking capacity of donkeys in that area. In other areas the yield is much less.

(iii) *Camel.*—Camel milk is seldom drawn for sale but the nomadic breeders may use it for drinking. From Baroda, it is reported that a camel can yield about 5 to 8 lb. of milk per day and in one lactation may yield anything up to about 1,500 lb. This is to be expected as the young camel cannot survive on anything less.

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\* The yields are actual average yields of milking goats and they have not been adjusted as in the case of yields of cows and she-buffaloes, for all three year old animals. See page 8.



## (4) ECONOMIC PERFORMANCE OF COWS AND SHE-BUFFALOES.

In order to study the milking efficiency of cows and she-buffaloes, they have been classified according to the milk yields in the table below. The figures are compiled from Appendices I and II.

*Grouping of milch animals according to production.*

Range of production		Cows		She-buffaloes	
Per day (lb.).	Per annum (lb.)	Number (lakhs.)	Percentage.	Number (lakhs.)	Percentage.
Up to $\frac{1}{2}$	Up to 185	117.56	28.6	..	..
Above $\frac{1}{2}$ to 1	From 186—365	66.62	16.2	1.62	0.8
„ 1 to 2	„ 366—730	203.50	49.5	35.89	18.3
„ 2 to 3	„ 731—1095	12.30	3.0	73.53	37.5
„ 3 to 4	„ 1096—1460	11.03	2.7	48.28	24.7
„ 4 to 5	„ 1461—1825	..	..	16.22	8.3
„ 5 to 6	„ 1826—2190	..	..	2.74	1.4
„ 6 to 7	„ 2191—2555	..	..	17.64	9.0
Total		411.01	(100)	195.72	(100)

The figures will show that so far as cows are concerned, about half the number in the Indian Union yield between one to two pounds of milk per day ; while about a third of the number of cows yield less than half a pound, 11 lakhs (2.7 per cent.) give the highest yield of three to four pounds per day.

The she-buffaloes, it will be seen from the last column of the table, are undoubtedly better producers of milk. About 18 per cent. yield less than 2 lb. of milk per day ; on the other hand, 9 per cent. yield between 6 to 7 lb. per day. They yield richer milk also.

The performance of cattle is of considerable economic significance and the subject is further discussed in the Chapter on “ Prices ” while dealing with the costs of milk production and price of village milk.

When the production is low, it is obvious that the sale of milk or milk products alone can hardly be sufficient to pay for the upkeep of most of the cows even when they are in milk and that they must be a definite burden when dry and do not give any return at all. Since, however, in each lactation they also produce a calf which can be subsequently marketed as a draught bullock or as a cow, it is obvious that

efficient marketing of cattle (the progeny) has a great bearing on the profitable keeping of cows.

(5) NUMBER OF CALVES AND THE QUANTITY OF MILK CONSUMED.

Only a negligible number of calves are weaned and reared handed chiefly on some Government farms. Ordinarily, all calves have their feed direct from the udder. The practice of allowing the calves to be present at the time of each milking and letting them suck some milk is so universally practised that unless the calf first suckies, most cows and she-buffaloes\* are in the habit of not dropping the milk. Indeed, if the calf dies many animals go off the milk altogether or the yield is considerably reduced. In such cases some other calf is brought near at the time of milking, but if this also fails, the animal is bluffed every time she is milked by means of the stuffed hide of her dead calf. A little milk from the cow may also be rubbed on to the stuffed calf so as to give it a peculiar smell believed to be liked by the cows.

There are various methods of allowing the calf to have its feed of milk. In some cases, it is allowed to suck a little milk from all the four teats both at the beginning and end of milking. In other cases after allowing some milk at the beginning from all the four teats, one teat is not milked at all and is left completely for the calf. In certain other areas, *e.g.*, Rajputana, where more attention is paid to the rearing of cattle than production of milk, a cow may not be milked at all and the entire milk may be given to the calf. When the cows are partially milked, the usual practice is to allow the calf to have all the milk from two teats or to let it take all the milk at one of the two milkings per day.

In all the above cases, it would be realised how difficult it is to judge correctly the quantity of milk taken by the calf at each milking or during the whole lactation. In the Village Enquiry, already referred to, attempts were made to collect this information and the findings are reproduced below :—

*Quantity of milk allowed to a sucking calf.*  
(IN POUNDS).

Tract.	Cows		She-buffaloes	
	Per male calf.	Per female calf.	Per male calf.	Per female calf.
Montgomery .. .. .	477	377	299	423
Haryana .. .. .	310	193	189	237
Kosi .. .. .	248	149	195	221
Deltaic (Bihar) .. .. .	191	211	259	331
Malvi (C. P.) .. .. .	141	142	267	269
Kankrej .. .. .	277	271	613	547
Ongole .. .. .	419	438	680	648
Average of 7 tracts .. .. .	295	251	356	382
	274		369	

\* The experience of military dairies is that the she-buffaloes are comparatively easy to wean.

The report under reference does not indicate the method of arriving at the above quantities but the figures are not without interest. For instance, it is observed that a bull calf is allowed more milk than a female and in some areas the difference is quite marked. This may be due to the fact that there is a much larger trade in 1 to 2 year old male calves (for rearing into draught bullocks) compared with the trade in female calves of the same age and, in order to maintain their satisfactory growth, they are fed proportionately more milk. It is seen from the above table that this is particularly so in the Haryana tract important for the export of fine quality male calves and bullocks. There a male calf is allowed as much as 310 lb. of milk during the first year of its growth compared with only 193 lb. allowed to its sister.

The position is completely reversed in the case of buffalo calves. With them the female gets more milk than the males. The quantities are 382 lb. and 356 lb. respectively. It is also seen that the cow calves get less milk than those of the buffalo. Smaller allowance of milk to the male buffalo calf compared with the female calf is due to the fact that there is little demand for the adult male buffaloes as draught animals, whereas an adult she-buffalo is a valuable asset to any producer or breeder. The quinquennial livestock census reports show that the mortality is considerably greater in the male buffalo calves (*see table below*). It is generally believed that they are allowed very little milk and in many cases starved and allowed to die.

*Number of calves below one year.*

(1945)

(LAKHS)

	Male.	Female.	Total
Cows .. .. .	90.07	90.38	180.45
She-buffaloes .. .. .	34.67	48.05	82.72
Total ..	124.74	138.43	263.17

It will be seen that the male buffalo calves are less by nearly 28 per cent. compared with the female calves, whereas the male and female cow calves are almost equal in number. Assuming that in Nature the sex ratio at birth is 50 : 50, the abnormally low survival of the male buffalo calves must indicate that there is some truth in the belief that they are not so well cared for as the female calves. If this is so and if any reliance is to be placed on the census returns, it becomes difficult to accept the anomaly reported in the Village Enquiry that the male buffalo calves receive nearly 20 per cent. more milk than the cow male calves and yet die in such large numbers.

In the absence of any other more reliable data, an average of 300 lb. of milk may be accepted as the quantity consumed directly by a calf (irrespective of sex and type) during its first year of life, assuming that they were allowed milk for 5 months only during the lactation; this is by no means a high estimate as at the rate of 300 lb., a calf would get only about one pound of milk per milking.

For the total population of 263.2 lakh calves, the annual quantity of milk consumed by them is about 961.6 lakh manuals. This quantity is equivalent to about 20.5 per cent. of the net hand-drawn milk produced by the cows and she-buffaloes.

It is estimated that about 50 lb. of milk are consumed by a kid during the lactation of the goat. The quantity of milk thus consumed by kids is calculated to be about 49.8 lakh maunds annually.

#### (6) SUMMARY OF MILK PRODUCTION.

The gross production of milk in the Indian Union (*see Appendix IV for full particulars*) can now be summarised as in the following table :—

*Summary of milk production.*

	Cows	She- buffaloes.	Goats	Total
Milking animals (lakhs) .. .. .	411	196	82	689
Percentage to total animals .. .. .	59.6	28.5	11.9	(100)
Annual yield of hand-drawn milk per animal (pounds) .. .. .	413	1,101	134	..
Annual net production of hand drawn milk (lakh maunds) .. .. .	2,062.4	2,619.7	133.4	4,815.5
Percentage to total production .. .. .	42.8	54.4	2.8	(100)
Quantity of milk consumed by calves and lambs (lakh maunds) .. .. .	659.4	302.2	49.8	1,011.4
<b>Annual gross production of milk (lakh maunds)</b>	<b>2,721.8</b>	<b>2,921.9</b>	<b>183.2</b>	<b>5,826.9</b>

In spite of the large number, cows provide only 42.8 per cent. of the total milk supply.

#### (7) FAT CONTENT OF MILK.

The milk of Indian cows and she-buffaloes is much richer than that obtained in countries abroad. This is a significant fact as, although the milk yield of our cattle may be low, the fat content or butterfat production is good. The result is, that, reckoned on a butter-fat basis, the yield, particularly of she-buffaloes, compares favourably with that of improved cattle in other countries.

The fat content in herd milk of Indian cows ranges from 4.5 to 5.5 per cent. according to different breeds. The milk of Indian she-buffaloes is richer still and is perhaps the richest milk in the world from any dairy animal, with a fat content that ranges from 6.5 to over 8 per cent.

Goat milk has a fat content of 4 to 5 per cent.

**(8) COMPARISON OF INDIAN CATTLE WITH WORLD'S MILCH CATTLE AND THEIR PRODUCTION OF MILK AND BUTTER-FAT.**

Recent and comparable data regarding the population of milch cattle in the different countries of the world are not available. In Appendix V, the information available in (i) Dairy Information (1947) by H. B. Cronshaw, (ii) The International Year-book of Agricultural Statistics (1940), and (iii) Agricultural Statistics (1947) issued by the Food and Agricultural Organisation of the United Nations has been collated and presented. It has not been possible to get figures for one representative year for all the countries, nevertheless, the compilation is of value in appraising the relative importance of different countries from the point of view of the dairy industry and in assigning a place to the Indian Union in the dairying countries of the world. A few observations are necessary for the interpretation of the figures. On account of the different methods of maintaining statistics in the various countries, the number of cows does not always represent milking cows. Sometimes the heifers are also included. Similarly, for some countries, the number of milking goats is available but the annual production of goat milk is not indicated separately. Hence, column 3 of Appendix under reference may include, in some instances, goat milk as well. For these reasons, the figures for "production of milk per cow" in column 5 should be considered as only approximate. Further, in most of the countries hand-feeding of calves is practised and milking machines are fairly extensively used. So it is not unlikely that the yields are of gross production. The yields of Indian cattle as given in this report are calculated, however, for net hand-drawn milk and for all three-year old cows and she-buffaloes kept for breeding or production of milk, irrespective of the fact whether they are in milk or not.

It will be seen from Appendix V that although the Indian Union has got a larger population of milch cattle than the countries of Europe (except U.S.S.R.), her production of milk is only about a fourth of that of Europe. The Indian Union produces nearly twice the quantity of milk produced in Canada, but she maintains nearly 15 times the number of cattle. Again Australia with nearly 48 lakhs of milch animals produces about 3/5 of the quantity of milk produced in the Indian union with 607 lakhs of milch animals (excluding goats). It will be apparent that India has a very large cattle population, more than that of any other continent, not to speak of any individual country. The dairy quality of the cattle within the boundaries of India itself varies so extensively that it is highly misleading to compare "Indian cattle" as a class in point of milk yields with small lots of specialised dairy

cattle in countries abroad, some of which have been improving their yields for the last 50 years, if not more. As stated before, there is one noteworthy feature concerning the Indian cattle, viz., that they field richer milk as compared with most of the breeds of cows abroad. It appears that from early times a major portion of the production of milk in India has always been utilised for making ghee and the early breeders, therefore, paid more attention to the richness of milk rather than to high yields. In other words, they thought more in terms of ghee (butter-fat) than milk. Even today, the breeders in remote areas, e.g., Kathiawar and Cutch, where ghee is the main consideration measure the performance of the animal not in terms of milk, but in terms of the number of tins of ghee obtained from it each tin containing four gallons. It is surprising how well they know the exact quantity of ghee yielded by each animal during a lactation.

In foreign countries also, the breeders began to realise at a later stage in the development of each important breed that spectacular yield of milk had little value unless the quantity of butter-fat produced during the lactation was also recorded. Accordingly, for many years now in these countries, the quantity of butter-fat produced by a cow per lactation has become of greater significance than the milk yield.

A comparison of the East Punjab cattle kept and bred under typical village conditions with cattle in some of the most advanced dairying countries shows that the relative performance of Indian cattle is not so bad as is generally supposed.

*Comparison of the East Punjab cattle with cows of Canada  
and Australia.*

						Annual milk yield per animal.	Average butter- fat content.	Annual yield of butter- fat per animal.
						(lb.)	(Per cent)	(lb.)
East Punjab—								
	Cows ..	..	..	..	..	1,445	5.0	72
	She-buffaloes ..	..	..	..	..	2,320	7.0	162
Canada—								
	Cows ..	..	..	..	..	4,408	3.8	167
Australia—								
	Cows ..	..	..	..	..	4,802	3.8*	182

\* In some cases the fat content is even less than 3.8 per cent.

It is seen that although the East Punjab cows kept under village conditions yield on an average 67 per cent. less milk than the Canadian cows kept on farms, their yield of butter-fat is less by only 57 per cent. The average fat production of the East Punjab she-buffaloes almost equals that of the Canadian cows. This shows what excellent animals buffaloes are as producers of butter-fat when compared with the cattle in other countries noted for their dairy animals.

It will further be seen from Appendix V that the Indian Union produces only 9.0 per cent. of the world supply of fluid milk (in reporting countries).

(9) POSSIBILITIES OF INCREASING PRODUCTION OF MILK IN THE INDIAN UNION.

That it is possible to increase easily, through proper feeding and management, the yields of Indian cattle by about 20 per cent, is indicated by the fact that village cows when brought to the Government farms give more milk in their subsequent lactations. The first progeny of these cows if well-bred shows a further improvement in milk yields over and above the increase recorded by their dams. The long dry periods are also shortened considerably, which proportionately reduces the cost of production of milk.\* These encouraging features and the fact that yields of many herds have substantially increased in a period of less than 20 years show the immense potentialities of Indian cows in matters of improving the milk yields through better feeding, selective breeding and efficient management.

She-buffaloes which are generally better cared for than the cows are, however, not so responsive to improved farm conditions. The increase in milk yield in their case is not the same as in the case of cows.

The Milk Sub-committee appointed by the Policy Committee on Agriculture, Forestry & Fisheries, Government of India observed (1945) that by proper feeding of village cattle, their milk yield can be increased substantially even up to 50 per cent. and recommended special facilities for the transport and distribution of cattle feeds and the locating of oil-seed crushing installations in rural areas so as to make readily available oil-cakes for cattle feeding.

Feeding of oil-cakes to cattle would also mean increasing the fertility of the soil through farm-yard manure.

Dr. H. D. Kay in his "Report† on Dairy Research, Dairy Education & Dairy Development in India." (October, 1940) has also observed that the greatest obstacle in the way of increased milk production is the shortage of feeding stuffs, the shortage of concentrated protein food being particularly severe. "Shortage of feeding stuffs leads not merely to daily milk yields which are absurdly low when compared with the proved potentialities as milking animals of many Indian breeds,

Data collected by the Indian Council of Agricultural Research from Military dairy farms (Unpublished).

† Not published.

but also to shorter lactation periods and unduly long intervals between calvings. Moreover, a much longer period than is necessary is required between the birth and the first service in the young heifer (30 months at least instead of 20 which would be needed if the young animal were adequately fed)." The ultimate solution of the problem, according to Dr. Kay would be in re-orienting the agricultural policy of the country with a view to increasing the amount of land devoted to the growing of cattle-feeding stuffs, even at the expense of areas given over at present to cash crops of no food value. Some immediate easement in the situation can be obtained by the elimination of useless bovines and through co-operative action between groups of cultivators or whole villages for joint use of draught animals (or even of tractors), thus setting free appreciable quantities of feeding stuffs now consumed by draught animals, for milk production.

The question of meeting the cattle feed shortage has received the attention of the Ministry of Agriculture, Government of India. Information was collected during 1946 regarding surpluses and deficits in different areas and surpluses of cattlefeeds were distributed to deficit areas first on an *ad hoc* basis and latter on, a Basic Plan covering nearly 3 lakh tons of cotton seed and oil-cakes was adopted. The export of oil-cakes was prohibited. The Basic Plan was operative till March, 1947, between surplus and deficit areas on a voluntary basis. The Central Government also imported 16,000 tons of wheat bran and pollard from Argentine and 7,400 tons of oats from Canada for cattle feeding during 1946-47. Financial assistance was also given by the Central Government to some Provincial Governments for the distribution of concentrates to producer-sellers of milk to help sustain or increase milk production.

In this context, the following table showing the estimated quantities of oil-cakes production in the Indian Union would be of interest :—

*Estimated quantity of oil-cakes production in the Indian Union.*

	Estimated quantity of oil-cakes produced (thousand tons).
Groundnut .. .. .	1,101
Sesamum .. .. .	168
Rape and mustard .. .. .	616
Linseed .. .. .	130
Coconut .. .. .	63

With imported separated milk powder it is possible to substantially supplement shortage of milk in urban areas. In Bombay city, buffalo milk with a fat content of 6 to 7 per cent. is toned down to a fat content of 4 per cent. by adding milk reconstituted from separated milk powder. The toned milk can be sold at a price within the means



of the labour classes: from 100 maunds of buffalo milk 160 maunds of "toned" milk can be obtained, thus increasing supplies by 60 per cent. The Government of Madras have opened a "Reconstituted Milk Factory" at Saidapet (Madras) in January 1947, where 1,000—1,200 measures (50—60 maunds) of milk are produced daily using the following ingredients in the proportion indicated :

Separated milk powder	..	..	..	100 lb.
Refined cocoanut oil	..	..	..	36 lb.
Carotene dissolved in 100 c.c. of cocoanut oil	..			$\frac{1}{2}$ gram.
Water	..	..	..	875 lb.

The constituents are mixed, pasteurised by holding for half an hour at a temperature of 140—150°F., passed through a "homogeniser" at a pressure of 1,500 lb. per square inch to completely emulsify the fat, cooled to 40°F. and bottled. The reconstituted milk is being largely used in catering establishments for making coffee, tea, etc. and this has released a considerable quantity of fresh milk for consumption in households. The use of whole-milk in restaurants is forbidden in the Bombay city.

#### (10) TREND OF MILK PRODUCTION.

There have been only a few sporadic attempts in the past to estimate the production of milk in some areas but they were not generally the results of so extensive an enquiry as the present one. The previous figures cannot, therefore, be used in comparison with the present ones for studying the trend of milk production in any one part of Indian Union, much less for the whole country.

There are two main issues on which depend the trend of production. Firstly, what has been the increase or decrease in the number of cows and she-buffaloes, say, during the past 10 years? Secondly, has the yield per animal improved, remained stationary or diminished during the same period?

In the early part of this chapter it is said that although six quinquennial cattle censuses have taken place so far, the areas of enumeration have not been the same. The increase or decrease in cattle numbers can, therefore, only be studied for the common areas. The table on the following page deals with the figures of human and cattle populations in the common tracts which cover nearly 51.2 per cent. of the total area of Indian Union.

**TREND OF CATTLE AND HUMAN POPULATIONS IN CERTAIN AREAS\***  
(In millions).

	Number 1920	Number 1930	Number 1940	Percent- age increase over 1920	
				1930	1940
Cows .. .. .	33.16	34.86	33.88	5.13	2.17
She-buffaloes .. .. .	11.02	11.98	12.64	8.71	14.70
Total milch cattle .. .. .	44.18	46.84	46.52	6.02	5.27
Human population † .. .. .	205.25	225.92	261.13	10.07	27.23

From the above figures it is evident that in 1940 the number of cattle has increased by about 5 per cent and the human population by over 27 per cent. in 20 years. The population of she-buffaloes has increased by about 15 per cent. but that of the cows by only about 2 per cent. Since a she-buffalo yields about two and a half times the quantity of milk given by a cow, it indicates that the increase in the production of milk has been about 7.8 per cent. It is also observed that the number of cows has gone down in 1940 as compared with 1930.

A comparison of the 1945 figures of milch cattle and of production of milk with those of 1940 (see table on the following page) shows that while the total population of milch cows in the Indian Union has remained stationary, there have been decreases in the number of milch cows in Himachal Pradesh, Hyderabad, West Bengal and the United Provinces. The increases over 1940, in Rajasthan and P.E.P.S.U. are very marked. Apparently, the increase of 4.86 lakhs of cows, i.e., 62.9 per cent., recorded during 5 years in Rajasthan, is due to faulty enumeration. The production of cow's milk has increased by 49 lakh maunds or 2.4 per cent. over the production in 1940.

\* Figures relating to cattle and human populations are in respect of Bengal (pre-partition), Bihar, Bombay, Madras, Sind, Punjab (pre-partition), Central Provinces, Assam, N.W.F.P., Ajmer-Merwara, Coorg, Delhi, Hyderabad, Mysore and Travancore. As human population in the different units of the Indian Union are available only for 1941, no attempt has been made now to separate figures relating to Pakistan and the Indian Union.

† The figures of human population relate to the censuses of 1921, 1931 and 1941.

Name of unit.	Milch cows			She-buffaloes		
	Number (1945) in lakhs.	Number (1940) in lakhs.	Percent- age variation to 1940.	Number (1945) in lakhs.	Number (1940) in lakhs.	Percent- age variation to 1940.
East Punjab ..	10.75	10.27	104.7	13.90	12.54	110.8
Saurashtra ..	5.09	4.80	106.0	3.74	3.85	97.1
P.E.P.S.U. ..	3.53	2.96	119.3	3.83	3.23	118.6
Himachal Pradesh ..	3.68	4.10	89.8	1.36	1.30	104.6
Rajasthan ..	12.59	7.73	162.9	6.02	3.36	179.2
Madras ..	50.96	50.62	100.7	29.43	28.94	101.7
Hyderabad ..	25.23	26.01	97.0	11.88	13.00	91.4
C. P. and Berar ..	43.41	42.07	103.2	9.84	9.83	100.1
West Bengal ..	28.59	32.28	88.6	1.38	1.38	100.0
Bihar ..	29.56	29.14	101.4	11.73	11.06	106.0
Vindhya Pradesh ..	13.18	12.13	108.7	3.98	3.55	112.1
United Provinces ..	54.93	59.06	93.0	45.44	41.99	108.2
Indian Union ..	411.01	407.38	100.9	195.72	183.56	106.6
Production of milk in Indian Union (lakh maunds) ..	2,062.44	2,013.95	102.4	2,619.71	2,435.53	107.6

Regarding she-buffaloes also, increases in "P.E.P.S.U." and Rajasthan are extraordinarily high and may be due to errors in enumeration. The populations of she-buffaloes in other areas except Hyderabad and Saurashtra have increased from 0.1 to 10.8 per cent. Taking Indian Union as a whole, the population of she-buffaloes has increased by 6.6 per cent. which in turn has resulted in an increase of 184 lakh maunds or 7.6 per cent. in buffalo milk production.

No precise information is available in regard to the changes that may have taken place in the milk yielding capacity of the cattle. The opinions of those who have been purchasing and dealing in cattle for a long time are conflicting, but the general consensus of opinion seems to be that the milk producing capacity of Indian cattle has deteriorated in as much as it is not so easy now-a-days to obtain good quality cows and she-buffaloes as was the case some twenty or thirty years ago. The opinion is also strongly held that the deterioration in cows has been

generally greater than in the she-buffaloes. Scarcity for milk prevails in all urban areas. Human population in towns and cities has increased very considerably during the past few years. The numbers of milch animals kept in towns and cities have also appreciably increased but without proper organization for their keeping or feeding. Even so, it has not been possible to meet the urban demands for milk. It seems likely that the shortages are due to cattle feeds and milch animals not being proportionately adequate to supply milk to the greatly inflated populations in the urban areas.

There is also no indication to show that the milking quality of cattle on the whole has improved during recent years, except perhaps in restricted areas where intensive work done by the Government departments may have resulted in some good. But even in this field there are no published data to support that such a thing has actually happened.

An examination of the available data indicates that the increase in milk production has not kept pace with increased demand. The urban dairy industry has developed in recent years, but in general the supply of milk and milk products in towns and cities is insufficient to meet demand. A well-organised urban milk industry will stimulate production in the neighbourhood of such centres and lead to the introduction of higher yielding breeds and perhaps also in the better feeding and management of the animals.

#### (11) SEASONAL VARIATIONS IN PRODUCTION OF MILK.

(a) *General*.—It is a matter of common knowledge that milk being nature's provision for the young of a animal, its production normally commences only upon parturition. The calving of a large number of animals during a particular month or months has, therefore, its influence on the variation in the production of milk. Similarly, it is known that during 4 to 6 weeks following parturition the yield gradually increases and reaches the maximum for that lactation. After remaining stationary for a short while (2 to 4 weeks) the yield gradually decreases when in about 7 to 9 months from the time of calving it ceases completely and the animal normally remains dry till she calves again. Season prevailing during the early part of lactation and mortality in unweaned calves have considerable influence on the length of lactation as also on variation in the milk yield.

The general behaviour of the milk yields from the day of calving to the day of going dry varies with different animals. The average lactation curve or the rate of decline based on the actual records\* of 140 she-buffaloes, kept at a number of military dairy farms in North India, is given in the diagram opposite page 11. The lactation curve for cows is not much different, except that due to a comparatively shorter lactation their maximum yield after calving is reached earlier than in the case of buffaloes.

(b) *Buffalo milk*.—It has been stated that the calving season is an important factor influencing the seasonal variation in the production of milk. In practically all parts of India where she-buffaloes are of importance they generally calve freely from July to September. This incidence of calving after the rains is due to the fact that green grazing or fodder is available almost everywhere. That helps the she-buffaloes to pick up condition and they generally take the bull during this favourable period (September to December). Wet conditions also help them physiologically to come into heat and take the bull more successfully at that time. As a result, the calvings occur in correspondingly larger numbers about nine to ten months later, i.e., from July of the following year. Provided the monsoon occurs normally, this cycle is repeated every year with a fair degree of regularity.

The diagram opposite page 11 shows the incidence of calving during the different months for 618 buffaloes of Murrah breed at the military dairy farms, Northern Circle\*. It will be seen that calving commences from July with the maximum number during August and September, whereas the lowest levels are reached during February and April. The records no doubt relate to animals kept under farm conditions but as the parent stock was drawn from village bred cattle, the distinct tendency to breed in a particular season is noticeable even at farms where the buffaloes get adequate stall feeding and green fodder throughout the year.

A study of the diagrams opposite page 11 would show that the maximum production of milk in an area would be in months following 5 to 8 weeks of the maximum calving. The following chart gives information regarding each area and facilitates the study of variations in production of milk:

*Production calendar for buffalo milk.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
East Punjab..	..	..	..	..	..	L	..	..	..	H	..	..
Delhi ..	..	..	..	..	L	..	..	..	..	H	..	..
Rajasthan ..	..	..	..	..	..	L	..	..	..	H	..	..
Bombay Province	..	..	..	..	..	..	L	..	..	..	H	..
Mysore ..	..	..	..	..	..	L	..	..	..	H	..	..
Travancore ..	..	..	..	..	..	..	..	L	..	..	H	..
Madras Province	..	..	..	..	L	..	..	..	..	..	H	..
Hyderabad ..	..	..	..	..	L	..	..	..	..	..	..	H
Central Provinces	..	..	..	..	..	..	L	..	..	..	H	..
United Provinces	..	..	..	..	..	..	L	..	..	H	..	..
Bihar and Orissa	..	..	..	L	..	..	..	..	H	..	..	..
Assam ..	..	..	H	..	..	..	..	L	..	..	..	..

H=Highest production

L=Lowest production.

\*Indian Council of Agricultural Research—Brief for Dr. N. C. Wright (unpublished).

It is seen that in all the important areas for the production of buffalo milk, viz., East Punjab, Rajasthan and United Provinces the maximum production occurs during October and November. The lowest level is reached during May and June which precede general calving and when most of the animals are dry or yield very little milk. At this time of the year the she-buffaloes feel the severity of the climate, particularly as there is scarcity of grazing and water for wallowing. It should, however, be noted that the placing of the maximum and minimum limits under the months are only approximate and that due to early or late break of monsoon, the periods can easily get shifted by a month or so either way during a year and also in the following year.

(c) *Cow milk*.—It is observed that cows do not have a calving season so well pronounced as she-buffaloes, but show a tendency to breed more freely during the early part of the year, January—February, and also during the early winter, October—December. The diagram opposite page 11 illustrates the incidence of calving from the records of military dairy farms, Northern Circle, for 447 Indian cows. It would be seen that the curve shows two distinct rises, in February—March, and in October—December. The curve also indicates that while the buffaloes seem to make full use of the monsoon, the cows are not benefitted to any great extent. If anything, they take the bull in the hot season (April—May) and calve in large numbers nine months after in the following months of January and February. For the second flush period in December they take the bull nine months earlier in March, which again is a dry and fairly warm month. It is also well-known that they are adversely affected by rain and that on a wet and misty day the yield of cows is greatly reduced, whereas it is hardly noticeable in she-buffaloes.

The chart below deals with the months in which the highest and lowest productions generally occur in different areas:—

*Production calendar for cow milk.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
East Punjab..	..	..	H	..	..	..	..	L	L	..	..	..
Delhi ..	..	..	H	..	..	..	..	L	..	..	..	..
Rajasthan ..	..	..	H	..	..	..	..	..	..	L	..	..
Bombay ..	..	..	L	..	..	..	..	H	..	..	..	..
Mysore ..	..	..	..	..	L	..	..	..	H	..	..	..
Travancore ..	..	..	L	..	..	..	..	..	..	..	..	H
Madras ..	..	..	..	..	L	..	..	..	..	..	..	H
Hyderabad ..	..	..	..	H	..	..	..	L	..	..	..	..
Central Provinces ..	..	..	..	H	..	..	..	L	..	..	..	..
United Provinces ..	..	..	H	..	..	..	..	L	..	..	..	..
Bihar and Orissa ..	..	..	H	..	..	..	..	L	..	..	..	..
West Bengal ..	..	..	..	..	H	..	..	..	L	..	..	..
Assam ..	..	..	H	..	..	..	..	L	..	..	..	..

H= Highest production.

L= Lowest production.

As explained in the case of a similar chart for buffalo milk, the highest and lowest levels may not occur exactly during the months indicated in the production calendar. It just shows the approximate seasons for the maximum and minimum production. It will be seen that in all the important areas for the production of cow milk, viz., the East Punjab, Rajasthan, the United Provinces, Bihar and West Bengal, the production is highest about March and lowest during August and September. In Bombay Province, Travancore and Madras Province the production is high during winter and less in other parts of the year.

The quantity of milk tendered for sale by the members of the Coimbatore Co-operative Milk Supply Union Ltd., Coimbatore, and the purchases of stable milk by the Milk Commissioner, Bombay, during the different months of 1947, given below, also illustrate the seasonal nature of milk production:

*Monthly variations in milk supply.*  
(1947)

	Purchases by the Coimbatore Milk Union.		Purchases of "stable milk" by Milk Commissioner, Bombay.	
	Quantity (Mds.)	Percent- age.	Quantity (Mds.)	Percent- age.
January .. .. .	4,132	10.8	..	..
February .. .. .	3,834	10.1	..	..
March .. .. .	4,073	10.7	6,337	5.8
April .. .. .	3,835	10.1	4,134	3.4
May .. .. .	3,833	10.1	6,987	6.5
June .. .. .	3,468	9.1	6,697	6.2
July .. .. .	2,929	7.7	12,898	11.9
August .. .. .	2,533	6.6	13,840	12.8
September .. .. .	2,317	6.1	14,906	13.7
October .. .. .	2,185	5.7	13,940	12.8
November .. .. .	2,266	5.9	14,056	12.9
December .. .. .	2,729	7.1	14,779	13.6
	<b>33,134</b>	(100.0)	<b>108,574</b>	(100.0)

(d) *Goat milk*.—Goat generally have to remain without shelter throughout the year. The shepherds who are expert stockmen adjust the kidding to suit the seasonal conditions. By allowing the male to remain in the flock at certain times of the year only, they avoid kidding during the wet seasons and manage to have most of it either in March or in October. At this time of the year the stock is also in good condition which helps the goats to bear strong progeny.

The shepherds do not usually milk the goats for the first four or six weeks but when the kids are sufficiently grown to pick up food for themselves, the goats are hand-milked. The goat milk, therefore, is generally available in greater quantities during May and December, *i.e.*, about two months after the kidding season.

#### (12) MILK RETAINED BY PRODUCERS FOR DOMESTIC USE.

As there are various factors which govern the requirements and availability of milk, it is found that there is hardly any uniformity in the quantity of milk retained by different producers for their own use. A producer often has a choice of retaining, (a) fluid milk from the cows, she-buffaloes or goats and (b) products, *e.g.*, curd, country-butter, ghee, *khos\**, butter-milk, etc., prepared from the milk of one or all of the above types of animals. Circumstances also make him partial to a particular type of milk or product. On some occasions when he has not sufficient milk to meet his sale commitments, he may retain only negligible quantities for his domestic use or may even go without it.

It is also observed that there is considerable difference between the urban and rural producers regarding retention of milk. Since there is a ready demand for milk in the urban areas, the producers there retain very little for their own use. In fact, in the rural areas the requirements of milk for domestic use may, in some instances, be the primary consideration for keeping milch cattle, but this is not so in the case of urban producers where the production of milk for sale is the main object. Estimates in some of the areas show that urban producers hardly retain 1 or 2 per cent. of the production for their own use.

The table below deals with the estimates in some of the rural areas:—

*Percentage of total milk production retained by producers and that available for marketing in some areas.*

	Retained by producers			Net available for marketing.
	As fluid.	As products.	Total.	
Delhi .. .. .	28.5	9.5	38	62
Bombay Province .. .. .	27.0	21.0	48	52
Mysore .. .. .	7.5	22.5	30	70
Madras Province .. .. .	2.5	4.5	7	93
Hyderabad .. .. .	12.5	4.0	16.5	83.5
Central Provinces .. .. .	32.0	20.0	52	48
West Bengal .. .. .	1.0	4.0	5	95
Average (weighted) .. .. .	9.0	8.0	17	83

A glossary of Indian terms used in the report is given at the end.



The above figures show considerable variation according to the conditions prevailing in each area but the averages show that the producers consume a little less than a fifth of the total milk produced. Of this nearly half is consumed as fluid and half as products. Four-fifths of the production is, therefore, available for marketing either as fluid or after converting it into products. It will be seen later that a considerable part of the milk is converted into ghee on the holdings of the producers and is marketed in this form. In the manufacture of ghee a large quantity of the valuable by-product "butter-milk" is obtained which is retained in the villages and is consumed by producers and others. The producers, therefore, consume not only a fifth of the total fluid milk production but also this by-product produced on their holdings.

Where the producers keep she-buffaloes as well as cows, it has been observed that they have a tendency to retain for their own use more of cow milk, as the buffalo milk is richer and yields proportionately greater outturn of products which brings them more money. The estimates vary for different areas, but on the whole it is considered that they consume roughly three-fourths cow milk and one-fourth buffalo milk. Accordingly, out of 818.6 lakh maunds of cow and buffalo milk (*i.e.*, about 17 per cent. of the total production) retained by them, it is estimated that cow's milk amounts to about 614 lakh maunds and the buffalo milk to about 205 lakh maunds.

*Retention of goat milk.*—In all the areas, apart from the usual small producers, a certain class of people keep large flocks of goats ranging from 25 to 200 or even more. These men do not generally have other cattle. It is observed that when they are grazing their flocks in the interior (generally after monsoon) they consume all the goat milk themselves, but when they are near large towns or cities, where there may be some market for goat milk, they retain very little for their own use. In some areas, *viz.*, Saurashtra, Rajasthan, the East Punjab and the United Provinces, they sometimes make ghee also. This ghee is sold at a cheaper rate for mixing with ghee obtained from cow and buffalo milks. It is done generally during winter.

In view of the above conditions, it is observed that the producers of goat milk retain a larger proportion of the production for their own use. From 134 lakh maunds of goat's milk produced annually in the Indian Union, one half or 67 lakh maunds is consumed by them as fluid or products and the remaining half is available for marketing as fluid or in the form of products.

### **B.—Imports of dairy products into India.**

#### **(1) TOTAL QUANTITY AND VALUE.**

For obvious reasons, there is no import of raw milk into India but small quantities of preserved milk, ghee, butter and cheese are imported. Compared with the value of milk produced in the Indian Union (355 crores), the value of imported products is 71\* lakhs or only

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The import-export data are for pre-partitioned India. Imports and exports play a very small part in the dairy economy of the country and it has not also been possible to separate the data for the Indian Union and Pakistan.

0.2 per cent. of the former. Against this, there was an export trade valued at about Rs. 33 lakhs on an average per year during the 15 years ending 1945-46.

The imported products are grouped as (a) butter, (b) cheese, (c) condensed and preserved milk and milk products and (d) milk foods for infants and invalids. These products are all imported by sea. Some ghee is also imported, mainly from across the land frontiers. The following table gives the average annual imports of different products together with their values for the 15-year period ending 1945-46. Figures for 1939-40 and 1945-46, which have been separately given, will give an idea of the extent to which the normal trade was disturbed due to World War II.

*Imports of dairy products into India.*

Product.	Average for 15 years (1931-32 to 1945-46).			1939-40		1945-46	
	Quantity.	Value	Import price per lb.	Quantity	Value.	Quantity	Value
	Cwt. (thousand)	Rs. (lakhs)	Rs. A. P.	Cwt. (thous- and)	Rs. (lakhs)	Cwt. (thous- and)	Rs. (lakhs)
Butter ..	4.7	5.07	0 15 4	8.5	9.18	0.1	0.23
Cheese ..	8.2	6.71	0 11 8	10.1	8.49	8.8	8.00
Condensed milk ..	55.5	21.82	0 5 8	75.5	25.63	79.7	33.14
Ghee* ..	38.9	21.40	0 7 11	49.1	26.9	0.2†	0.26
Milk foods etc. ..	8.9	16.80	1 10 10	11.4	23.13	17.6	34.75
Total ..	116.2	71.80	..	154.6	93.42	106.4	81.38

It will be seen that during 1945-46, the net imports of cheese, condensed milk and milk foods were higher than the average for the 15 years, while the imports of butter and ghee were insignificant. The reason for the increase in imports of the former food-stuffs is that tinned dairy products intended for the armed forces stationed in India have been included in the Custom's returns. Actually, however, the supply of imported dairy products like cheese, condensed milk and milk foods to civilians during the war years was very bad, as there was a world

\*Total value of imports into India calculated at the rate of Rs. 55 per cwt.

†Imports through "British Ports" only.

shortage. In August 1943, it was decided by His Majesty's Government in England that the World's exportable surplus of dairy products should be pooled and allocations for different countries should be made by the London Food Council. The purchases by recipients were also centralized. Accordingly, from 1st January 1944, the Government of India themselves arranged for importing these products intended for civilian consumption from Australia, New Zealand, U.S.A., etc., according to allocations made by the London Food Council. For distribution, four "Port Panels" were constituted, one each at Bombay, Calcutta, Karachi and Madras, under the Regional Food Commissioners. Import licences in respect of some of the products were issued to established importers in accordance with the volume of their pre-war business ; in respect of certain items, the Government themselves were the importers. Payments were made by the importers to the Government of India, who transmitted the amounts to the Ministry of Food in the United Kingdom. Prices were fixed by the "Port Panels" after which the food-stuffs were distributed through a chain of licensed retailers. The Panel scheme continued to operate till 1st January 1947.

The Government of India imported 12,200 tons of separated milk powder and 5,400 tons of whole milk powder during 1946 and 1947 for famine relief operations. These have not been included in the statistical statement reviewed above.

As the different dairy products shown in the table above have separate countries of origin and have had also different trends, an individual discussion for each product follows :

(2) IMPORTS OF BUTTER.

The following table illustrates the position of imports of butter during the 15-year ending 1945-46. It will be seen that up to 1939-40, the quantity of imports was increasing steadily ; the War affected the imports which during the last two years under review practically became insignificant.

*Imports of butter and cheese into India.*

Year.	Butter			Cheese		
	Quantity	Import price per lb. (ex-duty)		Quantity	Import price per lb. (ex-duty)	
		Cwt.	Rs. A. P.		Cwt.	Rs. A. P.
1931-32 .. .. .	2,659	1	5 0	6,670	0	12 2
1932-33 .. .. .	2,838	1	3 0	8,175	0	12 3
1933-34 .. .. .	4,014	0	15 5	9,125	0	11 7
1934-35 .. .. .	4,903	0	13 0	10,060	0	11 0

\*Includes trade through Kathiawar ports except the year 1945-46.

*Import of butter and cheese into India—(contd.).*

Year.	Butter			Cheese		
	Quantity	Import price per lb. (ex-duty)		Quantity	Import price per lb. (ex-duty)	
	Cwt.	Rs.	A. P.	Cwt.	Rs.	A. P.
1935-36 .. .. .	6,096	0	11 6	9,822	0	10 4
1936-37 .. .. .	6,628	0	12 10	10,775	0	9 11
1937-38 .. .. .	7,674	0	13 7	10,295	0	10 5
1938-39 .. .. .	8,230	0	14 11	10,373	0	10 2
1939-40 .. .. .	8,518	0	15 5	10,127	0	12 0
1940-41 .. .. .	7,483	1	0 4	7,880	0	13 4
1941-42 .. .. .	7,370	1	0 11	12,876	0	12 4
1942-43 .. .. .	2,756	1	2 1	1,600	0	13 8
1943-44 .. .. .	1,494	1	8 8	2,289	1	1 6
1944-45 .. .. .	38	2	1 4	4,652	0	13 2
1945-46 .. .. .	139	1	7 10	8,760	0	13 1
Average for 15 years .. .. .	4,723	0	15 4	8,232	0	11 8

The countries of origin and their importance are shown in the table below :—

*Countries consigning butter, cheese, condensed milk and milk food for import into India.*

(Annual average for 5 years—1939-40 to 1943-44).

	Butter	Cheese	Condensed milk.	Milk foods.
Average total imports (Cwt.)	5,524	6,954	49,151	26,750
Average value (Rs.)	6,50,947	6,22,995	20,91,829	14,27,248
	Per cent	Per cent	Per cent	Per cent
<i>Commonwealth countries—</i>				
United Kingdom .. .. .	2.4	6.5	4.0	57.0
Union of South Africa .. .. .	2.0	0.8	0.6	0.9

*Countries consigning butter, cheese, condensed milk and milk food for, import into India.—contd.*

(Annual average for 5 years—1939-40 to 1943-44)—*contd.*

—			Butter	Cheese	Condensed milk.	Milk foods
Australia	..	..	63.7	66.5	34.8	34.2
New Zealand	..	..	28.2	1.0	6.7	..
Others	..	..	2.1	2.3	5.9	5.5
Total			98.4	77.1	52.0	97.6
<i>Foreign countries—</i>						
Denmark	..	..	..	0.4	3.1	..
Netherlands	..	..	..	16.5	19.8	..
Switzerland	..	..	..	2.9	..	..
Others	..	..	1.6	3.1	25.1	2.4
Total			1.6	22.9	48.0	2.4

It will be seen that nearly two-thirds of the imports of butter are from Australia. New Zealand supplied 28.2, while the United Kingdom and the Union of South Africa contributed 2.4 and 2.0 per cent. respectively. Countries outside the Commonwealth supplied only 1.6 per cent. of the total imports.

(3) IMPORTS OF CHEESE.

From the table on page 30, it will be seen that on an average 10,000 cwt. of cheese were imported up to 1939-40. After the commencement of the War, the imports have become erratic.

The countries of origin and their corresponding shares are given in the table on page 31, which would show that over 66 per cent. of the cheese was obtained from Australia. Countries outside the Commonwealth despatched nearly 23 per cent. of the total imports of which the share of Netherlands was 16.5.

(4) IMPORT OF CONDENSED AND PRESERVED MILK.

This group consists of several products. Custom's returns record under the sub-groups: (i) condensed milk, whole, (ii) condensed milk, skimmed, (iii) dried milk powder, whole, and (iv) dried milk powder, skimmed. From enquiries, it is understood that other products like condensed milk (unsweetened), whole or skimmed, sterilized milk and preserved cream are also imported. The table on the following page gives the proportions of the different types as recorded in the Custom's returns during 1939-40 and 1945-46 :

*Types and proportions of products grouped as condensed or preserved milk.*

Products.	Approximate percentage of imports.	
	1939-40	1945-46.
1. Condensed milk whole .. .. .	26.9	23.3
2. Condensed milk skimmed .. .. .	37.8	5.2
3. Dried milk powder whole .. .. .	8.4	14.3
4. Dried milk powder skimmed .. .. .	26.9	57.2
Total ..	100.0	100.0

The trend of imports of the above products collectively is dealt with in the following table :—

*Imports of condensed milk, ghee and milk food into India.*

Year.	Condensed milk etc.		Ghee	Milk foods	
	Quantity	Import price per lb.	Quantity	Quantity	Import price per lb.
	Cwt.	Rs. A. P.	Cwt.	Cwt.	Rs. A. P.
1931-32 .. ..	54,697	0 4 10	44,177	9,730	1 11 3
1932-33 .. ..	44,717	0 4 4	44,280	8,286	1 9 3
1933-34 .. ..	46,275	0 4 4	41,681	10,733	1 2 4
1934-35 .. ..	47,654	0 5 0	44,862	8,107	1 5 0
1935-36 .. ..	50,322	0 4 10	42,337	8,687	1 6 4
1936-37 .. ..	45,950	0 4 11	48,761	6,928	1 9 4
1937-38 .. ..	59,115	0 4 8	54,718	8,696	1 12 1
1938-39 .. ..	62,068	0 4 7	46,866	9,718	1 10 11
1939-40 .. ..	75,504	0 4 10	49,070	11,433	1 12 11

\*Including trade through Kathiawar ports except during the year 1945-46.

*Imports of condensed milk, ghee and milk food into India\*—contd.*

Year.	Condensed milk, etc.		Ghee	Milk foods	
	Quantity	Import price per lb.	Quantity	Quantity	Import price per lb.
	Cwt.	Rs. A. P.	Cwt.	Cwt.	Rs. A. P.
1940-41 .. ..	53,384	0 5 10	52,099	7,455	1 14 8
1941-42 .. ..	66,827	0 6 8	37,897	6,757	1 12 4
1942-43 .. ..	30,049	0 7 7	34,447	4,158	2 1 0
1943-44 .. ..	19,992	0 7 1	42,236	3,948	2 1 4
Average for 13 years ..	50,504	0 5 3	44,879	8,049	1 10 2
1944-45 .. ..	96,832	0 7 4	14†	11,797	1 14 8
1945-46 .. ..	79,687	0 7 10	181†	17,569	1 12 3
Average for 15 years	55,538	0 5 8	38,908	8,933	1 10 10

From the table on page 31, it will be seen that the share of the Commonwealth of Australia was 34.8 per cent. 48 per cent. of the total imports was from countries outside the Commonwealth, the share of Netherlands being 19.8 per cent. in this total.

(5) **IMPORTS OF GHEE.**

Although it is a matter of surprise that India should be importing a product like ghee, it will be seen from the table on pre-page, that on an average 45,000 cwts. (for 13 years ending 1943-44) were obtained annually from the outside. Almost the entire imports of ghee are received from countries across the land frontier. The following table gives the shares of the various countries consigning ghee to India :

*Countries consigning ghee for imports into India.*

						Annual average for 3 years (1941-42 to 1943-44.)
Total imports .. ..	..	..	..	..	(Cwt.)	38,193
Total value .. ..	..	..	..	..	Rs.	21,00,615
						Per cent.
Afghanistan .. ..	..	..	..	..	..	2.3
Tibet, Nepal, Sikkim & Bhutan ..	..	..	..	..	..	97.5
By sea, mainly from Maskat territory and Trucial Oman ..	..	..	..	..	..	0.2

† Imports through sea ports only.

It will be seen that most of the ghee comes from Nepal, Tibet, Sikkim and Bhutan. It enters India mainly through land frontier stations in the United Provinces and Bihar. In the statistics relating to the trade across the land frontier routes, the values are not recorded. In view of the poor quality of the imported ghee, a nominal value of Rs. 55 per cwt. has been taken for calculating the value of imports into India.

The Food Ministry of the Government of India was exploring the possibility of importing ghee from Australia through trade channels and samples were obtained during 1947.

(6) IMPORTS OF MILK FOODS FOR INFANTS AND INVALIDS.

Milk foods generally are processed foods of well-known trade brands used for the artificial feeding of infants. They may be used by adults as well. In recent years, through the aid of the medical profession and propaganda on the part of the manufacturers' representatives, they have become more popular, but their imports have not undergone much change. Some of the brands are imported in bulk and are re-packed in smaller containers in India.

The shares of the various consigning countries are given in the table on page 31.

**C.—Exports of dairy products from India.**

Just as import of dairy products into India is unimportant, their export also is very little. There is no export of raw or processed milk, even for ships stores at ports owing to the use of tinned milk. Nearly 80 per cent. of India's export trade consists of ghee. The table below gives the average quantities and values of Indian exports for the 15-year period ending 1945-46 together with the position during the years 1939-40 and 1945-46 :

*Exports of dairy products from India.*

	Average for 15 years (1931-32. to 1945-46)			1939-40		1945-46	
	Quantity	Value	Export price per cwt.	Quantity	Value	Quantity	Value
	Cwt. (thousand)	Rs. (lakhs)	Rs. A.	Cwt. (thousand)	Rs. (lakhs)	Cwt. (thousand)	Rs. (lakhs)
Butter ..	5.2	5.41	103 11	6.9	7.02	83	0.21
Casein ..	5.6	1.14	20 6	6.8	1.08	..	..
Cheese ..	0.03	0.02	61 7	0.03	0.02	..	..
Ghee ..	37.6	25.88	68 13	62.4	38.22	1,010*	0.99
Total	48.4	32.45	..	76.2	46.34	1,093	1.20

\*Exports through sea ports only.



The exports of dairy products from India have fallen both in quantity and value. During 1945-46, the exports were very small, being valued only at Rs. 1.2 lakhs.

The main products exported are butter, casein and ghee. Detailed figures regarding quantities of these commodities exported may be seen in the following statement:—

*Exports of butter, casein and ghee from India.\**

Year	Butter		Casein		Ghee	
	Quantity	Export price per cwt.	Quantity	Export price per cwt.	Quantity	Export price per cwt.
	Cwt.	Rs. A.	Cwt.	Rs. A.	Cwt.	Rs. A.
1931-32 .. ..	7,671	112 5	5,315	11 6	52,629	78 5
1932-33 .. ..	7,157	93 1	7,805	9 4	45,847	75 9
1933-34 .. ..	6,458	94 2	8,209	18 15	46,016	62 1
1934-35 .. ..	6,372	96 14	7,952	19 9	48,105	65 3
1935-36 .. ..	7,924	97 10	11,452	19 10	44,597	66 0
1936-37 .. ..	6,234	105 8	12,577	26 7	49,820	65 2
1937-38 .. ..	6,221	96 4	7,507	23 14	53,978	64 13
1938-39 .. ..	6,474	96 11	5,500	13 11	53,980	64 13
1939-40 .. ..	6,944	108 7	6,845	15 13	62,436	61 4
1940-41 .. ..	5,779	94 15	4,804	23 9	49,608	72 3
1941-42 .. ..	7,719	112 12	4,990	31 9	42,371	75 15
Average for 11 years	6,814	101 14	7,541	19 11	49,944	68 0
1942-43 .. ..	2,674	137 3	679	55 6	12,677	93 0
1943-44 .. ..	516	160 13	151	144 1	737	188 7
1944-45 .. ..	38	259 11	200	95 0	224†	244 11
1945-46 .. ..	83	264 12	..	..	1,010†	98 0
Average for 15 years	5,218	103 11	5,599	20 6	37,602	68 13

\* Including exports through Kathiawar ports except during the year 1945-46. Reports through sea ports only.

The exports were, more or less, steady till the commencement of the World War II in 1939. From 1942-43, onwards the quantities have decreased very considerably, but prices have practically doubled.

Most of the butter is exported from Gujrat (Bombay Province) and is packed in tins of  $\frac{1}{2}$  or 1 lb. Casein, which is manufactured from skimmed milk, is a by-product of the butter industry. The casein is usually manufactured under village conditions and the quality is rather crude. Ghee from India is mostly exported for the use of Indians who have settled in Burma, Straits Settlements and other adjacent countries.

The destinations of the exports of butter, casein and ghee from India may be seen in the following table :—

*Countries of destination for exports of butter, casein and ghee from India.*

Country	Annual average for 5 years (1939-40 to 1943-44).		
	Butter	Casein	Ghee*
Total exports .. .. . (Cwt.)	4,727	3,494	28,677
Total value .. .. . (Rs.)	5,12,687	87,659	20,14,907
<i>Commonwealth countries—</i>	Per cent	Per cent	Per cent.
Aden and Dependencies .. .. .	5.5	..	1.5
Ceylon .. .. .	10.6	4.2	4.7
United Kingdom .. .. .	..	58.3	3.1
Straits Settlements .. .. .	..	..	32.6
Other countries .. .. .	19.4	32.9	18.6
Total .. .. .	35.5	95.4	60.5
<i>Foreign countries—</i>			
Burma .. .. .	52.4	..	30.6
Portuguese East Africa .. .. .	0.7	..	1.1
Iraq .. .. .	1.0	..	0.5
Iran .. .. .	3.8	..	0.9
Other countries .. .. .	6.6	4.6	6.4
Total .. .. .	64.5	4.6	39.5

\* Excludes trade through Kathiawar ports.

**LEGAMA**

**D.—Net available market supply and value of milk in the Indian Union.****(1) NET AVAILABLE SUPPLY OF MILK IN THE INDIAN UNION.**

The following table gives the net available supply :—

	Cow's milk	Buffalo's milk	Goat's milk	Total
	Mds. (Lakh)	Mds. (Lakh)	Mds. (Lakh)	Mds. (Lakh)
<b>(1) Production.</b>				
Gross production .. ..	2,721·8	2,921·9	183·2	5,826·9
Consumed directly by calves ..	659·4	302·2	49·8	1,011·4
Net hand-drawn .. ..	2,062·4	2,619·7	133·4	4,815·5
Retained by producers for domestic use, as fluid and products.	614·0	205·0	67·0	886·0
Marketable quantity, as fluid and products.	1,448·4	2,414·7	66·4	3,929·5

	Value	Quantity	
		Actual.	In terms of fluid milk
	(Lakh Rs.)	Cwt.	(Lakh Mds.)
<b>(2) Imports (1945-46).</b>			
Butter .. ..	0·23	139	0·03
Cheese .. ..	8·00	8,760	1·22
Condensed milk, etc. .. ..	38·14	79,687	2·76
Ghee .. ..	0·26	181	0·04
Milk foods, etc. .. ..	34·75	17,569	1·99
Total ..	81·38	106,336	6·04
<b>(3) Exports—(1945-46)</b>			
Butter .. ..	0·22	83	0·02
Casein .. ..	..	..	..
Cheese .. ..	..	..	..
Ghee .. ..	0·99	1,010	0·23
Total ..	1·21	1,093	0·25
<b>(4) Net available market supplies.</b>			
Home production .. ..	..	..	3,929·5
Net imports .. ..	..	..	5·8
Total ..	..	..	3,935·3

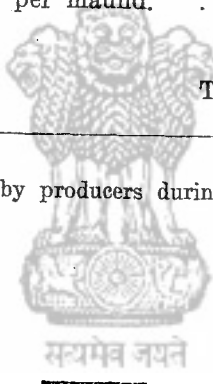
The net available supply of milk and milk products for consumption in the Indian Union is 3,935.3 lakh manuds *plus* 886 lakh maunds retained by producers for their domestic use, or a total of 4,821.3 lakh maunds of fluid milk per annum.

(2) VALUE OF MILK PRODUCED IN THE INDIAN UNION.

	Rs. crores.
(i) Value of approximately 64* per cent. of the total production used for the manufacture of products at a nominal price of Rs. 6† per maund ..	184.08
(ii) Value of approximately 36* per cent. of the total production used as fluid milk at a nominal price of Rs. 9-12-0† per maund. .. ..	170.38
Total value ..	354.46

\* See page 53.

† Estimated price realised by producers during 1945.



## CHAPTER II—UTILISATION AND DEMAND

The use of milk in the human diet is as old as the history of mankind. Being the most perfect single food known, it has always been held in high esteem. It contains, in an easily digestible form, all the materials (except iron), essential for growth and maintenance of life. No other single food is known which can be used as its substitute. If this had not been so, milk would have long disappeared from the dietary of civilised people for the reason that it is highly perishable and, unless it is immediately given some kind of treatment, becomes unsuitable or at times even dangerous for use within a few hours of its being drawn from the udder. In spite of these drawbacks, there is always a demand for it because its food value is universally recognised to be unique.

### A.—*Per capita* consumption of milk and milk products.

#### (1) FACTORS AFFECTING.

From a market standpoint the effective demand for milk and milk products is entirely urban in character. Although over 95 per cent. of the milch cattle are found in rural areas and over 90 per cent. of the Indian population live there, the rural demand for milk is relatively poor in the sense that there are not many purchasers of milk in the villages. The reasons are that many of the consumers themselves are the producers, while due to the comparatively low purchasing power of the Indian peasantry, many cannot afford to purchase, and consume milk or milk products. Many persons, including children, have to go completely without milk. Even in the dairying tracts, where much larger quantities of milk are produced, 16 per cent. of the families do not consume any milk or its products at all.\* Conditions in other rural parts of India, where the production is much less, should, therefore be still worse in regard to the purchase or consumption of milk and milk products.

In towns and cities, where the family cash income is expected to be more and the standard of living generally higher than in rural areas, there is a regular demand for milk and its products, not only in greater quantities but from a larger section of the population. For instance, if at any time of the year milk is not available in a village the people merely go without it and very rarely, if at all, are efforts made to procure it from neighbouring villages. But in cities and towns the supplies have to be regular and new villages are always immediately tapped if any of the usual sources fail. Similar is the case with ghee. Villagers may go without it but not so the people in towns. Production of ghee is fairly widely distributed but at times it has to be sent for from distant places to make up local shortages in certain areas.

The urban demand for milk as measured by the *per capita* consumption in the cities and towns is dependent mainly on three factors, viz., (a) the availability of milk, (b) the *per capita* income of people and (c) the price.

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\* Report on a Village Enquiry regarding Cattle and the Production and Consumption of milk in Seven Breeding tracts of India (1939).

(a) *Availability of milk.*—Milk is partly produced in the urban area itself and is partly obtained from surrounding villages. Being a highly perishable product, an efficient and suitable organisation is needed to bring it rapidly and regularly to the consumers in a wholesome and fresh condition. In India, facilities for rapid assembling, transport under suitable conditions and cheap distribution of village milk are not yet developed. There are practically no large organisations to handle in bulk the rural supplies for consumption in urban areas.

Scattered and small scale production adds to the difficulties of assembling large supplies. On an average, a producer possesses only 2 to 3 milch animals and big herds are generally absent. The daily average production is only about 2 to 2½ maunds per village or about one maund per square mile for the whole country. Such a position makes economic assembling of village milk difficult and unavoidably raises the consumer's price. This factor often limits the availability of cheap fluid milk in sufficient quantities for consumption in towns and cities.

(b) *Per capita income of people.*—Other conditions being the same, this is the most important factor which limits the *per capita* consumption of milk. It has been the experience in all countries that families having small incomes consume the smallest quantity of milk or its products and the consumption proportionately increases with the family income, when at a certain point it becomes stationary. Although comparative figures of family incomes and standards of living in different countries are not available, the average *per capita* income in India is relatively small compared with many other countries and, as may be seen later in next section, the Indian *per capita* consumption of milk is also relatively low.

Further, in India unlike some other countries, there is nothing to guide consumers in spending their money on those articles of food which give them the maximum nutrition. No propaganda is done by the State in the matter of advertising milk and its products with a view to increasing their sale, nor are there any large dairying concerns in the country which can undertake this work. Dairies abroad spend large sums annually on "Consumers' education" and make successful efforts to drive home continuously to their clients the value of milk and its products. Such a service is absent in India, where it is needed most.

(c) *Price.*—It is obvious that the factors of price and income go hand in hand, so far as the *per capita* consumption is concerned. Most of the families with low income can spare only a small sum to buy their requirements of milk and milk products. The price of milk is, therefore, the limiting factor with them. It is seen later in the Chapter on "Prices" that the price of milk in India is not much different from that in some other countries and in some cases milk is even dearer in India although in Western countries it is produced, processed, bottled

and delivered under more hygienic and expensive conditions. The fact is that with a low *per capita* income the Indian has to purchase milk at a dearer price than a consumer abroad. This, to an extent, is responsible for a low rate of consumption of milk in India.

As has already been pointed out, there is no effective substitute for fluid milk apart from its condensed and dried forms, but in the case of milk products—particularly ghee—substitution with edible oils is possible, especially with hydrogenated vegetable oils (vanaspati). The relative prices of such products must, therefore, have some effect on the demand for ghee. The following table shows the relative price position and having regard to the fact that the fall in price has been greatest in the case of vanaspati, it is not surprising that *halwais* and others are finding it more advantageous to use increasing quantities of vanaspati instead of ghee for cooking. Further, owing to the fact that this hydrogenated product is made to resemble ghee as closely as possible, unscrupulous vendors find it profitable to adulterate ghee with it. Even the so-called “village ghee” brought in by villagers to the towns has been found on occasions to contain 75 per cent or more of vanaspati. There is, therefore, a great need for tightening up the administration of local Food Adulteration Acts to prevent consumers of genuine ghee from being defrauded.

*Comparative prices of ghee, vanaspati and certain vegetable oils.*

(Per maund)

Year			Ghee (Khurja)	Vanaspati (Delhi)	Coconut oil (Alleppey)	Groundnut oil (ex mill Calcutta)	Mustard oil (ex mill Calcutta)
			Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1937-38	..	..	44 15 0	..	11 2 2	13 4 8	16 15 8
1938-39	..	..	45 3 0	..	7 8 7	9 6 7	15 3 1
1939-40	..	..	46 3 0	20 13 10	9 10 0	10 8 3	14 3 0
1940-41	..	..	57 3 0	21 14 4	9 5 5	10 14 0	13 10 10
1941-42	..	..	60 10 0	26 2 6	10 7 4	12 0 4	13 3 10
1942-43	..	..	114 0 0	52 13 9	26 2 4	23 15 7	22 11 2
1943-44	..	..	146 12 0	59 12 7	31 9 3	38 8 0	45 13 4
1944-45	..	..	135 4 0	53 10 11	35 8 3	36 1 11	45 2 4
1945-46	..	..	170 8 0	62 5 9	42 13 6	36 5 3	40 10 10
1946-47	..	..	167 7 0	75 12 7	66 8 9	54 13 0	48 4 3

**(2) AVERAGE DAILY *per capita* CONSUMPTION OF MILK AND MILK PRODUCTS  
IN DIFFERENT PARTS OF THE INDIAN UNION.**

The average daily *per capita* consumption of milk in the Indian Union works out to 5.4(5.8)\* oz. This includes the quantity consumed both as fluid and as products.

On account of the divergence between the distribution of cattle and human population and the widely differing regional milk yields, the average *per capita* consumption in the different areas of the country varies very considerably. Although there is hardly any inter-provincial or inter-State trade in fluid milk, there is some inter-provincial movement in ghee. This has been taken into account in computing the *per capita* consumption of milk. A comparatively small quantity of butter also moves from one part to another, but separate figures for this are not available. The following table deals with the *per capita* consumption in the different units of the Indian Union :

*Average daily per capita consumption of milk (including products) in  
different Areas.*

Area								Daily <i>per capita</i> consumption
								Oz.
<b>Provinces—</b>								
Assam	..	..	..	..	..	..	..	1.23
Bihar	..	..	..	..	..	..	..	4.37
Bombay	..	..	..	..	..	..	..	2.02
Central Provinces and Berar	..	..	..	..	..	..	..	2.00
Delhi	..	..	..	..	..	..	..	5.53
East Punjab	..	..	..	..	..	..	..	16.89
Madras	..	..	..	..	..	..	..	4.18
Orissa	..	..	..	..	..	..	..	2.64
United Provinces	..	..	..	..	..	..	..	7.16
West Bengal	..	..	..	..	..	..	..	2.77

\*Figures in brackets indicate the *per capita* consumption as given in the Report on the Marketing of Milk in India (2nd Edition).



**Average per capita consumption of milk (including products) in different areas—contd.**

Area							Daily per Capita consumption
							Oz.
<i>Unions and States—</i>							
Baroda	..	..	..	..	..	..	13.57
Hyderabad	..	..	..	..	..	..	3.64
Kashmir	..	..	..	..	..	..	4.54
Madhya Bharat	..	..	..	..	..	..	7.34
Matsya	..	..	..	..	..	..	11.02
Mysore	..	..	..	..	..	..	4.33
Patiala and East Punjab States Union	..	..	..	..	..	..	3.97
Rajasthan	..	..	..	..	..	..	15.72
Saurashtra	..	..	..	..	..	..	18.78
Travancore	..	..	..	..	..	..	1.34
Vindhya Pradesh	..	..	..	..	..	..	3.26
Other provinces and States	..	..	..	..	..	..	5.87
Indian Union	..	..	..	..	..	..	5.45

The population figures as recorded in the 1941 human Census have been used. Using the figure 15.1 per cent. as the rate of increase in population between 1931 and 1941 Censuses and the usual formula for calculating population in inter-census years, the population of the Indian Union during 1945, can be estimated as 3383 lakhs; the *per capita* consumption on this basis would work out to 5.12 oz. per day.

It will be seen that the maximum consumption, *viz.*, 18.78 oz. is in Saurashtra followed by 16.89 (15.2) oz. in East Punjab and 15.72 oz. in Rajasthan. Consumption in Assam is the lowest, being only 1.23 (1.3) oz. per day. This may be compared with the pre-war *per capita* consumption of milk, including products, in some foreign countries; Australia 44.4 oz., Canada 56.8 oz., Denmark 40.3 oz., Great Britain 40.7 oz., and the United States of America 35.6 oz.

As has already been stated, there is no inter-provincial trade in fluid milk. The trade in milk products, chiefly ghee, is practically negligible when compared with its immense production. The consumption in any area, therefore, depends upon the local supplies and density of population and it is observed that areas which possess better quality dairy cattle and produce more milk per day, per square mile, have a higher rate of *per capita* consumption. The map opposite page 42 illustrates the position in different regions and zones.

The first region which comprises Kashmir, East Punjab, Madhya Bharat, Saurashtra, the United Provinces and Bihar possess only 55.5

per cent. of the total population of the Indian Union, but produces 70.5 per cent. of her total butter fat. This accounts for the high rate of *per capita* consumption in this region. In the peninsular area consisting of a part of the Bombay Province, Hyderabad, Madras Province, Orissa and Mysore, the human population is 34.5 per cent. while the production of butter fat is only 26.7 per cent. which explains the comparatively low rates of consumption in this region. In the two eastern provinces, *viz.*, West Bengal and Assam, conditions are much worse. They possess 10.0 per cent. of India's population but produce only 2.8 per cent. of her butter fat. These provinces, no doubt, import large quantities of butter fat in the form of ghee, but taking this also into account the *per capita* consumption comes only to about 2 oz. of milk per day.

The poor quality of the milch cattle is, no doubt, responsible to a great extent for the low consumption in the peninsular region, but an examination of the inter-provincial movements in ghee shows that with its production of milk fat much below the average, this region exports ghee to other parts and thereby further diminishes the already scant supply of milk fat for local use. These exports and imports are indicated in the map by a separate symbol. Of this the Madras Province alone contributes nearly 1 lakh maunds of ghee per annum. This is perhaps due to the fact that in preference to ghee, the people in the peninsular region have become partial to the use of vegetable fat. In the South Indian cookery, cocoanut and gingelly oil are used with little or no ghee.

It has already been stated on page 15 that the indigenous cows and she-buffaloes produce milk much richer in butter-fat content than the milch animals of other countries. Quantitatively, the Indian Union produces 2,062 lakhs maunds of cow's milk and 133 lakh maunds of goat's milk containing about 5 per cent. fat and 2,620 lakh maunds of buffalo's milk containing about 7 per cent. fat. This is equivalent to a production of about 293 lakh maunds of butter fat in 4,816 lakh maunds of milk. In other words, the milk produced in India, contains on an average more than 6 per cent. butter fat or nearly 58 per cent. more than that contained in the milk produced in other countries, which has about 3.8 per cent. fat or even less. If *per capita* consumption of milk is to be regarded solely from the point of view of butter-fat intake, the Indian consumption of 5.45 oz. should be increased by 58 per cent., *i.e.*, 8.6 oz., so as to make it comparable with consumption in other countries.

### (3) *Per capita* CONSUMPTION IN URBAN AREAS.

Information regarding *per capita* consumption during 1945 in cities is available only for Calcutta, Bombay and Madras. This works out to one, three and 1.4 oz. respectively. Compared with the provincial consumptions of 2.77, 3.21 and 4.18 oz. in West Bengal, Bombay Province and Madras Province, these figures show a very marked deterioration in the supplies of milk to the three cities. It has, however, to be remembered that the populations in these cities have increased by 31.3 per cent., 81.2 per cent. and 41.6 per cent. respectively as compared with the population in 1941, and although steps have been taken by the Provincial Governments to augment supplies of milk to these cities, it would appear that quantities of milk available are still woefully inadequate.

In the second edition of the Milk Marketing Report, data relating to

the consumption of milk and milk products in 23 cities\* collected during 1935, were given to illustrate that *per capita* consumption in a city is always higher than in the rural parts of the province in which the city is situated. The reasons for the higher consumption were given as (i) the proportionately larger *per capita* income of the town dweller and (ii) the facility available in cities for purchasing milk in small quantities and at all times. If the *per capita* consumption in cities has now fallen to low figures, it should be attributed to the rapid migration of the population from villages to cities without a corresponding increase of milch animals to meet the increased demands of milk. The reasons given above for a higher consumption figure in cities still operate : they now tend to increase further the urban demand for milk. The necessity for augmenting the supply of a vital food like milk to ensure a balanced diet to a city dweller is now more important than ever before.

\* The table from the second edition of the milk marketing report reproduced below is of great interest :—

DAILY *per capita* CONSUMPTION OF MILK IN CITIES (IN OUNCES) (1935).

	Fluid milk	Dairy products in terms of milk	Total consumption.	Corresponding provincial consumption (1940)	Ratio of urban to provincial consumption.
Peshawar .. ..	4.5	11.9	16.4	6.8	2.4
Lahore .. ..	4.0	12.4	16.4	15.2	1.1
Delhi .. ..	4.9	17.8	22.7	5.2	4.4
Karachi .. ..	6.1	11.9	18.0	18.0	1.1
Hyderabad .. ..	5.8	14.1	19.9		
Sukkur .. ..	4.0	10.1	14.1		
Shikarpur .. ..	8.8	16.0	24.8		
Lucknow .. ..	3.4	14.0	17.4	7.0	2.5
Kanpur .. ..	3.3	12.5	15.8		
Agra .. ..	3.0	15.8	18.8		
Patna .. ..	3.8	5.0	8.8		
Cuttack .. ..	0.6	2.9	3.5	3.4	1.0
Calcutta .. ..	3.8	6.0	9.8	2.8	3.2
Dacca .. ..	3.0	5.0	8.0		
Shillong .. ..	2.1	5.8	7.9		
Bombay .. ..	4.3	11.3	15.6		
Poona .. ..	4.2	9.8	14.0	5.5	2.7
Nagpur .. ..	2.2	3.9	6.1		
Hyderabad (Deccan) ..	2.5	4.7	7.2		
Bangalore City .. ..	2.5	3.6	6.1		
Madras .. ..	2.3	4.6	6.9	3.7	2.0
Madura .. ..	2.9	5.3	8.2		
Trichinopoly .. ..	2.6	4.5	7.1		
Average of 23 cities ..	3.7	8.9	12.6	5.8	2.0

**(4) *Per capita* CONSUMPTION OF MILK AMONG DIFFERENT CLASSES  
OF PEOPLE.**

Where milk or its products have to be purchased, it is observed that the rate of consumption depends upon the income. Extensive data to illustrate this are, however, not available. The Economic Adviser to the Government of India conducted an enquiry\* into the middle class family budgets during November 1945, February, May and August 1946. The enquiry was limited to the salaried employees of the Central Government working in different provinces in the pre-partitioned India. The amounts spent by middle class families on dairy products (milk, butter, ghee and curds) classified according to income groups are indicated in Appendix VI.

In interpreting the figures given in the Appendix, it should be borne in mind that both the cost of living and prices of dairy products are higher in Bombay, Calcutta and Madras than in the three provinces as a whole. It will be observed that those dwelling in cities and getting less than Rs. 100/- generally spend less on dairy products than their counterparts in the mofussal. The position of the city dwellers regarding consumption of dairy products improves as the income becomes high and they spend more liberally on dairy products than their rural brothers. In the following table the amounts spent by "Middle class families" on milk, butter, ghee and curds together with total *per capita* expenditure on dairy products are indicated:—

*Consumption of dairy products by middle class families.*

—	Average number per family	Milk	Butter	Ghee	Curds	Expenditure per capita of dairy prod- uce per month
		Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
<b>Madras City</b> .. ..	6.40	16 0	2 8	5 6	2 12	4 0
<b>Bombay City</b> .. ..	6.30	24 14	5 2	4 5	0 5	5 7
<b>Delhi</b> .. ..	6.20	21 14	1 9	13 3	1 8	7 1
<b>Calcutta</b> .. ..	7.24	13 12	0 15	4 9	0 12	2 12
<b>United Provinces</b> .. ..	6.20	11 3	0 15	9 8	0 13	4 2
<b>Bihar and Orissa</b> .. ..	7.50	12 12	0 10	7 9	0 10	2 14
<b>Bombay Province (ex-Bombay city)</b> .. ..	5.7	18 2	2 5	6 4	0 10	4 13
<b>Central Provinces and Berar (including Central India, Rajputana and Ajmer Merwara).</b>	6.50	11 14	2 2	9 6	1 4	3 13
<b>Madras (Province ex-Madras City)</b>	6.20	14 1	2 9	5 7	2 15	4 0
<b>Bengal and Assam (ex-Cal- cutta).</b>	6.90	13 12	1 1	5 7	0 15	3 1

\* A detailed report on the "Enquiry into Middle class Family Budgets" has recently been published by the Economic Adviser to the Government of India.

It will be observed that the amounts vary from Rs. 2-12-10 in Calcutta City to Rs. 7-1-0 in Delhi. In an earlier section it was shown that the city dweller "consumes" more of dairy products than people in rural areas. But owing to short supplies *per capita* consumption in cities are now lower than the average consumption in the Indian Union as a whole. The above figures show that the city dweller, as usual, spends more on dairy products, but owing to high prices the quantities that he is able to secure are much less than what they used to be in normal times.

The Indian Research Fund Association has made several studies on Indian diets in recent years. A report\* dealing with the intake of important groups of foodstuffs in the various parts of the country and amongst different classes of people has been published. Foodstuffs of animal origin are grouped under (a) ghee, (b) milk and butter-milk, and (c) meat, fish and eggs, in this report. Most of the families investigated belonged to the poorer classes. Their diet was typical of that consumed throughout the year by millions in the areas in which the surveys were carried out. Some of the 56 examples given in the report are reproduced in the table below:—

*Consumption of ghee, milk, butter-milk, meat, fish and eggs per day.*

Economic status.	Daily per capita consumption		
	Ghee	Milk and butter-milk	Meat, fish and eggs.
	(Oz.)	(Oz.)	(Oz.)
<b>Ferozepore (Punjab)—</b>			
(i) Middle class Sikhs .. .. .	1·5	12·3	0·1
(ii) Sweepers .. .. .	0·4	2·4	0·7
Agriculturists and casual labour— <i>Kangra Valley</i> ..	Nil	Nil	Nil
<b>Delhi—</b>			
(i) Labourers earning 4 to 8 annas per day ..	Nil	Nil	Nil
(ii) Small tradesmen earning Rs. 8/- to Rs. 30/- p.m. ..	0·3	5·7	Nil
Cultivators in an area where leprosy is common— <i>Barbot (U.P.)</i> .. .. .	Nil	0·9	Nil
Cultivators in an area where leprosy is rare— <i>Narendra-nagar (U. P.)</i> .. .. .	0·4	6·4	Nil
Small cultivators— <i>Navasari (Baroda State)</i> .. .. .	0·3	2·3	Nil

\*Notes on the results of diet surveys by W. R. Aykroyd (1940).

**Consumption of ghee, milk, butter-milk, meat, fish and eggs per day.**  
—(contd.).

Economic status	Daily per capita consumption		
	Ghee	Milk and butter-milk.	Meat, fish and eggs.
	(Oz.)	(Oz.)	(Oz.)
<b>Bombay City—</b>			
(i) Gujarati families, mostly municipal sweepers. Average family income Rs. 36/- p.m. . . . .	Nil	1·5	0·7
(ii) Deccani families, mostly peons and laboratory assistants. Average family income Rs. 40/- p.m. . . . .	Nil	0·6	0·9
(iii) Northern India Hindus, mostly ward-boys. Average family income Rs. 55/- p.m. . . . .	0·5	1·6	2·0
(iv) Middle class Deccani families mostly clerks. Average family income Rs. 135/- p.m. . . . .	0·9	7·6	4·1
<b>Agriculturists—Raipur (C. P.)</b> . . . . .	Nil	0·2	0·1
<b>Small cultivators—Closepet (Mysore)</b> . . . . .	Nil	1·9	Nil
<b>Labourers—Hyderabad (Deccan)</b> . . . . .	Nil	Nil	0·13
<b>Weavers (leprosy in 13 out of 14 families)—Madras City</b> . . . . .	Nil	1·1	1·5
<b>Small cultivators—Trichinopoly District</b> . . . . .	Nil	Nil	0·1
<b>Tea plantation labourers—Nilgiris</b> . . . . .	Nil	Nil	Nil
<b>Puri (Orissa)—</b>			
(i) Tradesmen, etc. (relatively well-to-do) . . . . .	0·2	6·5	1·5
(ii) Labourers and fishermen . . . . .	Nil	Nil	1·4
<b>Jamshedpur (Bihar)—</b>			
(i) Industrial workers earning upto Rs. 1 per day . . . . .	0·5	0·5	0·6
(ii) Industrial workers earning upto Rs. 1·8 per day . . . . .	0·8	1·4	0·7
(iii) Industrial workers earning upto Rs. 3 per day . . . . .	1·3	2·6	1·3
(iv) Industrial workers earning over Rs. 3 per day . . . . .	1·8	5·7	1·0
<b>Aboriginal tribes practising agriculture—Santhal Parganas</b> . . . . .	Nil	Nil	Nil
<b>Calcutta—</b>			
(i) Middle class families earning Rs. 200 to Rs. 500 p.m. . . . .	1·0	11·0	5·6
(ii) Marwari families, business and professional people with Rs. 100 to Rs. 1,000 p.m. . . . .	2·0	11·7	Nil
<b>Industrial labourers earning Rs. 8 to Rs. 10/- p.m.—</b>			
<i>Cachar (Assam)</i> . . . . .	Nil	0·5	0·2
<b>Tea plantation labourers—Jorhat (Assam)</b> . . . . .	Nil	Nil	0·7

The report observes that in majority of rice eating groups which consume about 15 to 25 oz. of rice per head per day as the main item of food, the intake of milk and its products is negligible. Many of the families in different areas do not have any food of animal origin at all. The figures show that consumption, to a great extent, depends upon the earning capacity of the family and this is particularly noticed in the case of industrial workers at Jamshedpur. The workers earning up to Rs. 3 per day consume nearly twice the quantity of milk, ghee, meat, fish and eggs than those earning up to Rs. 1[8]- per day.

(5) TREND OF MILK CONSUMPTION IN THE INDIAN UNION AND OTHER COUNTRIES.

(a) *Indian Union*.—So far as the trend of *per capita* consumption of milk on an all-India basis is concerned, there is no evidence to fall back upon except for two previous estimates in 1933 by Major General Sir John Megaw\* and Col. Sir Arthur Olver†. Even the Royal Commission on Agriculture did not hazard an all-India figure for the *per capita* consumption. Megaw's estimates were based on replies to a questionnaire issued to dispensaries in about 600 villages in eight provinces. His enquiry showed that an adult took, on an average, 3.52 oz. of fluid milk and 0.32 oz. of ghee equivalent to 5.12 oz. of fluid milk, or a total of 8.64 oz. Olver arrived at an all-India figure by considering the fluid milk consumption of four cities, *viz.*, Bombay, Calcutta, Lahore and Poona and by taking certain arbitrary figures for consumption of ghee in urban areas and for milk and milk products in rural areas. He obtained a figure of 10 oz. of milk per head per day for the entire country. It may be mentioned here that the figure he took for Poona was an old estimate made by Dr. H. Mann as early as 1913.

It is clear that both these authorities did not take into account the milk yield, lactation period or the total number of milch cattle. The Village Milk Enquiry of the Indian Council of Agricultural Research which was confined to certain selected dairying tracts only showed that the average consumption of milk in them was about 10 oz. per head per day. Owing to the limited scope of the enquiry, the results cannot apply to the whole country. They simply indicate that taking into account the non-producing areas the average Indian consumption would be less than 10 oz.

There are, therefore, practically no data available to indicate the trend of Indian consumption. As has already been pointed out, the human population of India has increased by over 27 per cent. against an increase of only 5.3 per cent in the cattle number, during the 20 years ending 1941. This apparently shows that the *per capita* consumption of milk and milk products in India is on the decrease unless the milk

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\*An Enquiry into certain Public Health Aspects of village Life in India (1933).

†Assessment of the Annual Contribution of Livestock in India to Indian Economy, (1933).

yield of the cattle is improving. Unfortunately, however, the consensus of opinion seems to be that the milking quality of animals in the country has deteriorated and not improved during this period. According to the 1931 human and 1935 cattle census the *per capita* consumption worked out to 6.6 oz. per day. On the basis of the 1940 cattle and 1941 human census this figure is reduced to 5.8 oz. for pre-partitioned India. According to 1945 cattle census and 1941 human census, the daily *per capita* consumption in the Indian Union is reduced to 5.3 oz. It is further reduced to 5.1 oz. if the increase in population (estimated) during 1941-45 is taken into consideration.

(b) *Other Countries.*\*—Most of the countries abroad have endeavoured in recent years to increase their production and consumption of milk. In some, the increase in output has far exceeded the growth in their population. To meet the new problems created by increased production, rigid Government machinery for supervision has been set up in these countries, which has resulted in a higher standard of cleanliness and a greater assurance of safety in the quality of milk put on the market. The figures below illustrate the extent of increase which a premier dairy-ing country—Denmark—has been able to achieve during the last 80 years.

*Trend of milk production in Denmark.*

	1870**	1900**	1934**	1939†	1942†
Number of dairy cows (thousands)	808	1,075	1,716	1,642	1,391
Annual yield of milk per cow (pounds).	2,976	4,850	7,055	8,067	;
Annual milk production (thousand tons).	1,082.4	2,460	5,313.6	5,163	3,278
Butter exports (thousand tons) ..	9.8	60.0	147.6	147.7	85.0

The figures hardly require any explanation: the War in Europe naturally has affected the industry during 1942.

The gross production of milk in England and Wales in 1937-38 was 1,438 million gallons (1,800 lakh maunds) of which 860 million gallons went for liquid consumption, 423 million gallons for manufacture and 155 millions for feeding livestock. In 1944-45, the gross production was 1,402 million gallons. Liquid consumption accounted for 1,151 million gallons, 163 million gallons went for the manufacture of edible goods only and 88 million gallons for stock-feeding. The daily consumption

\*The information given in this section has been taken from "Dairy Information" by H. B. Cronshaw.

\*\* Nutrition—League of Nations, 1939.

†Foreign Agriculture, Washington D. C. VIII, 1944, quoted from Dairy Information by H. B. Cronshaw (1947), p. 19.



of milk per head of the population was 0.37 pint in 1933-34; it was increased to 0.65 pint in May 1943 and 0.70 pint in May 1944. In the United States of America, the average production of dairy products over the period of 1925-39 per head of population was 807 lb. ; 1942, it was 886 lb. and in 1943, 837 lb. The figures given by U.S. Department of Agriculture (1943) show the following consumption per person per year.

	Pounds	
	1941	1942
All dairy products (milk equivalent) .. .. .	818	866
Liquid milk .. .. .	354	376
Butter .. .. .	16	15.7
Cheese .. .. .	6	6.4
Evaporated milk .. .. .	17.2	17.0
Ice cream .. .. .	13.7	16.0

The Central Governing body of the dairy industry in U.S.S.R. (the SOYUZMOLOKO) was created in 1930. In 1932, 14.9 per cent. of the liquid milk (12,300 tons) was pasteurised and in 1939, 75.5 per cent. (1,28,000 tons). Milk consumed in Moscow and Leningrad was as follows:—

*Consumption of milk in Moscow and Leningrad.*

	1914	1932	1939
	Tons.	Tons.	Tons.
Moscow .. .. .	24,400	29,700	1,60,500
Leningrad.. .. .	..	41,100	5,09,700

The production of butter in factories also increased from 69,600 tons in 1932 to 1,86,800 tons in 1939.

The progress of the dairy industry in a few countries noted above, emphasise how urgent it is for our country also to take suitable measures to step up the production of milk by the selective breeding and better feeding of our milch stock and increase consumption by providing adequate marketing facilities for milk and its products.

## B.—Utilization of milk in the Indian Union.

### (1) GENERAL.

There are a number of ways in which milk is used in India. These may be broadly classified under two divisions, *viz.*, milk used as fluid and that used in the form of manufactured products.

Estimates of the quantities consumed as fluid and for the manufacture of various products, are given in Appendix VII. The averages for the Indian Union are summarised in the table below. A diagrammatic representation of the production and consumption of milk in various forms appears opposite page 43.

### *Utilization of milk in the Indian Union.*

	Annual quantity (lakh maunds).	Percentage* to total production.	Percentage to total quantity converted into products.
Consumed as fluid milk .. .. .	1,740.96	36.2	..
Converted into ghee .. .. .	2,085.16	43.3	67.8
„ „ <i>Dahi</i> .. .. .	438.44	9.1	14.3
„ „ Butter .. .. .	301.85	6.3	9.8
„ „ <i>Khoa</i> .. .. .	199.50	4.1	6.5
„ „ Ice cream .. .. .	19.96	0.4	0.6
„ „ Cream .. .. .	29.63	0.6	1.0
Total .. .. .	4,815.50	(100)	(100)

\*The percentages to total production utilized in various ways given in the second edition of the Milk Marketing Report (p. 66) are as under:—

Consumed as fluid .. .. .	28
Converted into ghee .. .. .	57
„ „ <i>khoa</i> .. .. .	5
„ „ curd .. .. .	5.2
„ „ butter .. .. .	1.7
„ „ ice-cream .. .. .	0.3
„ „ cream .. .. .	0.4
„ „ other products .. .. .	2.4

Compared with the position in 1941, it will be observed that the manner of utilization of milk in the Indian Union has changed remarkably during five years. The consumption as fluid milk has increased from 28\* to 36.2 per cent., chiefly at the expense of ghee production : only 43.3 per cent of the total milk supply was used for the manufacture of ghee against 57 per cent. previously. The consumption of *dahi* and butter has also increased to 9.1 and 6.3 per cent. respectively against 5.2 and 1.7 per cent. recorded previously. Taking ghee and butter together the percentage of total milk now utilized (49.6 per cent.) has registered a decline of 9.1\* per cent. The decrease can be accounted for in two ways. Firstly, due to the increase in the population of towns and cities, village sources of milk are tapped more intensively and more village milk is being diverted and consumed in urban areas, particularly in beverages, than ever before. Secondly, the extensive use of Vanaspati in cooking, in preference to ghee, which has become prohibitively costly, has discouraged ghee production in remote villages. The recent changes in the manner of utilization of milk are developments in the right direction as producers always get a better return when they are able to sell their surplus as milk than when they market milk products.

## (2) CONSUMED AS FLUID MILK.

It is seen that a little over a third of the total production is consumed as fluid milk. This proportion is on the basis of total milk ; but if only cow's milk is considered, it is observed that nearly half of it is consumed as fluid. In other words, cow's milk is given a preference for liquid consumption and buffalo milk, which contains a higher percentage of fat, for manufacture of products. Where the production of goat's milk is not large, it is generally consumed in the fluid form, but in areas where large flocks of goats are kept, *e.g.*, Saurashtra, parts of Rajasthan, etc., it is used extensively for the manufacture of ghee. *Khoa* is also made from it, particularly when the flocks are in the vicinity of a large town.

From Appendix VII it will be seen that in Kashmir, Delhi, West Bengal and Assam, 50 to 60 per cent. of the total production of milk is consumed in fluid form. This is due to the fact that these areas are deficient in milk supplies and import large quantities of ghee from other parts. Milk is generally consumed as such after boiling. It is also taken in preparations such as *Rabri*, *Kheer*, *Kurchan*, etc. The popular beverages of India in which milk is used are tea and coffee. It is estimated that about 30 lakh maunds of milk are annually consumed in India in tea and coffee. This works to about 1.7 per cent. of the total quantity (1740.96 lakh maunds) consumed as fluid. In certain areas, however, *e.g.*, Saurashtra and Bombay and in most of the towns and cities, more than 20 per cent. of the available quantities of milk is used in beverages. At the restaurants and tea-shops, milk of buffaloes (and goats) is preferred to that of the cow, as a larger quantity (estimated at 25 per cent. of the latter is needed to obtain the required milky colour in tea or coffee.

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\*The separation of figures relating to Pakistan in the latter figure will not affect the conclusions in any appreciable manner.

In the second edition of the Milk Report, it was shown that out of a total production of 6,293 lakh maunds of milk in pre-partitioned India, 1,762 lakh maunds or 28 per cent. was consumed as fluid milk. Recent enquiries show that out of 4,816 lakh maunds of milk produced in the Indian Union, 1,741 lakh maunds representing 36.2 per cent. of the total production are consumed as fluid milk. The increase should be attributed also to the restrictions imposed by local Governments on the commercial production of milk products and to the increase in the population of towns and cities which has resulted in more and more of the village produced milk being diverted to adjacent towns.

### (3) FOR MANUFACTURE OF GHEE.\*

Over 2,085 lakh maunds of milk, representing 43.3 per cent. of the total production of milk in the Indian Union (or nearly 68 per cent. of the quantity converted into products) are used annually in the manufacture of ghee. Ghee is the most valuable among the milk products and it keeps good for long periods even under tropical conditions of storage and ordinary packing. These account for its extensive manufacture.

Buffalo milk, being richer in fat than cow's or goat's milk, gives a larger outturn of ghee. The buffalo ghee is white in colour, is hard and has a well-defined texture. It is also said to have better keeping qualities than ghee made from the milk of other animals. It fetches a better price than cow's ghee which is yellowish and of a softer texture. While some stress is laid upon the nutritive and digestive value of cow's milk for consumption in liquid form, when it comes to selecting milk for manufacturing purposes, the milk of buffaloes is preferred, both for giving an increased outturn and for obtaining a superior quality of product.

The quantities of milk used in the manufacture of ghee in different areas is given in Appendix VII. Against an average of 43.3 per cent. for the Indian Union, as much as 80 per cent. of the production in Central Provinces and Berar and 60 to 70 per cent. in Mysa and Hyderabad is used for making ghee. Delhi, which has a large market for fluid milk on account of its high proportion of urban population, uses only 18.7 per cent of its milk for ghee making. Its requirements of ghee are obtained through imports from adjoining areas.

### (4) FOR MANUFACTURE OF *Dahi*.

Nearly 438 lakh maunds of milk per annum or 9.1 per cent. of the total production is marketed as *Dahi*. This is also the first stage in the manufacture of ghee and it is not customary with the producers to curdle separately a quantity of milk for their domestic use. Usually from the lot that is curdled for the manufacture of ghee a portion is consumed as *Dahi*. Estimates of the total quantity of *Dahi* thus used are, therefore, difficult to make.

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\*See "Report on the Marketing of Ghee and other Milk Products in India (AMA 50) for full details.

*Dahi* prepared for sale is generally made from buffalo milk because it gives a firmer texture and does not break up when sold in small lots. In the South, there is comparatively an important trade in *Dahi*. Every morning small earthen pots of *Dahi* are brought in bullock carts from villages to the large towns. In Trivandrum (Travancore) there is a market place used exclusively for *Dahi*. In Madras Province as much as 15 per cent of the total production of milk is marketed in this form. Plain *Dahi* and curried preparations with curd form quite an important item in the diet of the people of the South. In the North, *Dahi* is beaten up into a drink called *lassi*, to which may be added salt or sugar. Cold *lassi* is a popular summer drink, particularly in the East Punjab and Western U.P.

(5) FOR MANUFACTURE OF BUTTER (COUNTRY AND CREAMERY).

About 302 lakh maunds of milk or 6.3 per cent of the total production is marketed in the form of country and creamery butter. Assuming an outturn of 4.3 lb. of butter per maund of milk, the approximate gross yield of butter works out to 15.6 lakh maunds. The production of creamery butter is estimated as 2.2 lakh maunds per annum which accounts for approximately 30 lakh maunds of milk. The remaining 272 lakh maunds are converted into what is known as "country" butter. Creamery butter is made from mechanically separated and churned cream on the same principles as employed in other countries. Addition of colour and salt and methods of packing for retail sale are other points common to creamery butter made abroad and that produced in India. It is consumed by the middle classes in urban areas.

Country butter, on the other hand, may be made by churning sweet milk, curd or even cream (sometimes by beating it with hand without the use of a churn) and has a very variable composition. For instance, in a few samples that were analysed it was noticed that the fat-content varied from 60 to 65 per cent., the moisture-content from 10 to 40 per cent. and the acidity from 2 to 27 per cent. It is, nevertheless, an important intermediate product in the preparation of ghee. Due to its acid flavour, the country butter is preferred by some for eating particularly with *chapaties*. In certain parts, e.g., North Bihar, Bombay and Madras Provinces and Mysore, people generally buy it for preparing ghee in their own households and fairly large quantities of country butter are marketed. This is usually done with the object of ensuring the purity of ghee on the assumption that the butter has not been adulterated.

For making both types of butter, buffalo milk or cream is universally used except at some of the military dairy farms, where surplus cow milk may be utilised.

(6) FOR MANUFACTURE OF *Khoa* (AND *Chhana*).

About 200 lakh maunds or 4.1 per cent. of the total production of milk in the Indian Union is used for making *khoa*. This product is obtained by partially evaporating the moisture from whole milk in an open pan placed over a fire. The product contains about 20 to 25 per cent moisture, the remaining being milk solids. It is finished up in

the form of small balls or pats, each weighing about 2 to 3 lb. Only occasionally *khoa* is eaten as such. It is mainly used for making Indian sweetmeats for which there is a large demand. This is particularly so during the many festivals. Pounded sugar, dry nuts, flavouring substances and sometimes colouring matter too are added in preparing *khoa* sweets of different sizes and shapes. *Khoa* by itself does not keep well and fermentation sets in rather soon, unless it is preserved with sugar. Sweetmeats made from *khoa*, however, keep good in summer for four to five days and in winter for ten to twelve days.

For *khoa* manufacture, buffalo milk is largely in demand because cow milk not only yields yellowish *khoa*, but lacks body and texture. The outturn from cow milk is also less compared with that from buffalo milk. Occasionally, *khoa* may be made from goat milk and sometimes from skimmed milk. There is no specific demand for the latter types of *khoa* and they are not of commercial importance. They are usually made with a view to finding a market for goat or skimmed milks, and sometimes for making a product for mixing with *khoa* made from buffalo milk.

It will be seen from Appendix VII that the manufacture and use of *khoa* is confined mostly to Western and Northern India. In the peninsular India and in Central Provinces it is not much used. In the United Provinces 13.6 per cent. of milk is converted into *khoa*. This is due to the large number of cities and towns and also to the large number of *melas* which are held periodically at the several places of pilgrimage in the province. Many lakhs of persons assemble at these centres. For them, thousands of sweetmeat shops spring up temporarily and nutritious sweetmeats made from *khoa* are sold in large quantities.

*Chhana*.—In Bengal, instead of obtaining milk solids in a marketable form through evaporation of the moisture, it is done through acid coagulation and subsequent drainage of whey. Cow milk is generally used for this purpose, as buffalo milk is not available there in large quantities. After bringing the milk to the boil, a little lemon juice is added which helps the separation of solids from the whey. The coagulated mass is transferred to a piece of cloth and the water is allowed to drain off. The drained solids are called *chhana*. This is used in the same way as *khoa*, but certain sweetmeats, e.g., *rasgullas* and *sandesh* can only be made from *chhana*. Sweetmeats made from it are generally served with syrup and do not have the same keeping quality as those made from *khoa*.

#### (7) FOR MANUFACTURE OF ICE-CREAM.

The consumption of ice-cream as such is insignificant although indigenous frozen products, e.g., *kulfi*, *malai-ka-baraf*, etc., have been produced and consumed for a very long time. Several local Governments had banned the use of milk in the manufacture of ice-cream or similar indigenous products. It was estimated that 20 lakh maunds of milk (0.4 per cent. of the total production) was used for making ice-cream, etc. The largest quantity, viz., 11 lakh maunds was so utilized in U.P. where owing to the large number of cities and annual *melas*, the

consumption was high. Modern ice-cream plants have been established at Bhopal, Bombay, Madras and Calcutta, but these were either using imported milk powder or had suspended production. Ice-cream is likely to become popular, during summer, in the Indian Union.

#### (8) FOR MANUFACTURE OF FRESH CREAM.

The quantity of milk used in the preparation of cream required for making creamery butter has already been accounted for in section 5 above. The quantity of fresh cream manufactured for sale as such is considered in this section. It is observed that the quantity of milk utilized for this purpose is practically negligible, being only about 30 lakh maunds or 0.6 per cent. of the total production of milk. Fresh cream is used entirely in cities.

#### C.—Demand and utilization of by-products.

The two by-products available for consumption are butter-milk obtained from curd in ghee making and skimmed milk obtained in the manufacture of cream and creamery butter.

##### (1) BUTTER-MILK.

This is a by-product which is always obtained in the manufacture of ghee by the indigenous method. Curdled milk is put in an earthen or metal vessel and water—warm or cold according to the season—is added to it. The mass is agitated and churned with a bamboo pole, the lower end of which carries wooden beaters. With the help of a rope which is pulled by one or two persons, depending upon the quantity of curd, the bamboo pole is kept rotated. When the butter “breaks”, more water is added to it and the floating grains of butter are gathered and removed. What remains behind is known as *chass*, *lassi*, *mattha* or butter-milk. It may contain a little fat in it as the *desi* method of churning is not very efficient.

On an average, about 27 lb. of butter-milk are obtained in making a pound of ghee. On this basis, in the making of about 110 lakh maunds of ghee annually in the Indian Union (from 2,085 lakh maunds of milk) approximately 2,970 lakh maunds of butter-milk are produced. Most of it is consumed by the producers themselves and is very often given gratis to others nearby. Sometimes it is fed to cattle and occasionally, some of it may even be run to waste but the quantity thus disposed of is insignificant. On the whole, its sales are not much except in some towns. It often happens that butter-milk is the only product left with the producer and he sells away his entire production of milk or ghee. Butter-milk is drunk as such or is eaten as porridge or gruel made from crushed maize, etc.

##### (2) SKIM (SEPARATED) MILK.

All separated milk available in India is machine skimmed. Out of the milk required in the manufacture of fresh cream for sale and for making creamery butter, approximately 54 lakh maunds of skimmed milk are obtained annually, assuming that its outturn is about 90 per cent. of the whole milk.

Skimmed milk is rarely sold in the market as such. It is mainly utilized for adulterating or mixing with whole milk, particularly in large towns and cities and in the preparation of cheaper type of curd, occasionally of *khova*, and for manufacture of casein. Small quantities are used for feeding calves or cattle at Government Farms. In the "Bombay Milk Distribution Scheme" (see page 171) "toned" milk brought from Anand is prepared by adding requisite quantity of freshly skimmed milk to whole buffalo milk to bring down the fat content of buffalo milk to about 4 per cent.

### (3) MANUFACTURE OF CASEIN.

The quantity of casein manufactured from skim milk in the Indian Union, during recent years has shown a tendency to decrease.

### D.—Utilisation and demand for condensed and preserved milk in the Indian Union

It has been said previously that about 64,000 cwt. of tinned milk are annually consumed in India, mostly by the Army and by a few people in cities, large towns and hill stations.

The above quantity works out to about 2.2 lakh maunds of fluid milk per annum. Compared with the total consumption of 4,800 lakh maunds of hand-drawn milk, the consumption of tinned milk dwindles into insignificance. Nevertheless, during the past few years, imported milk powders have largely been used in feeding school children and expectant and nursing mothers in Government sponsored "Priority Milk Schemes". As already stated, the Central Government arranged for the import of 17,700 tons of milk powder (both whole and skimmed) for use in Priority Schemes and for distribution through local Governments to restaurants, eating establishments and the general public.

While the controlled use of skimmed milk powder is desirable in as much as it relieves the scarcity for locally produced milk in densely populated areas, the possibility of re-constituted skimmed milk being used to adulterate hand-drawn milk should be guarded against. Unfortunately, such adulteration is not only common, but during festivals, etc., when there is a sudden rush for milk, reconstituted milk from imported skimmed milk powder is often sold as whole milk. Necessary steps should be taken by the Public Health authorities to prevent such mal-practices.

### E.—Seasonal variations in demand.

#### (1) FOR FLUID CONSUMPTION.

The cattle have more green grass during the monsoon and milk production rises but the demand for milk decreases in this part of the year. During summer, it is said that due to the availability of cucurbit, mangoes, melons and other fruits the demand for milk is lessened. In winter, a greater quantity of milk is consumed either by itself or along with tea. It is common for instance in the large cities to drink tea several times during the winter days but during summer or monsoon this is reduced considerably if not altogether replaced by cold drinks which have no milk in them.

It is noted, however, that milk being a highly perishable product its consumption in fluid form is governed by local supplies. If at any



time and place, the production increases above the average without a corresponding increase in demand, the surplus is generally converted into products, mainly ghee which can keep well for several months. At all the dairies, the surplus milk is converted into cream or butter.

There is yet another flexible factor which, to a certain extent, balances the production and consumption of milk in case of a contingency. This is the quantity retained by producers for domestic use. When the demand for milk and its products is greatest, the producers retain the least quantity of milk for their use. This may be, despite the fact, that production also is high during the season, *e.g.*, winter. Similarly, during monsoon, when demand is least but production is still high, producers retain the maximum quantity of the extra milk for their own use.

## (2) FOR MANUFACTURE OF PRODUCTS.

It will be seen later in the chapter on "Prices" that the producers receive comparatively more money by selling milk as fluid than in the form of products. They, therefore, always try to dispose of as much quantity as possible for fluid consumption. Thus the market requirements for fluid milk limit the quantity converted into products.

Ghee being the main product made from milk, its seasonal requirements have the greatest influence on the quantity of milk used for manufacturing purposes. There is perhaps not a marked difference in the consumption of ghee itself during the different months, but the ghee made during winter, *i.e.*, October to March, has a lower acidity, better grain, firmer texture and more uniform colour and is said to keep better, than the ghee made during other seasons. For commercial purposes as well the largest quantity of ghee is clarified and tinned during this period (with maximum packings in December and January) for sale throughout the year. Some of the other products also *e.g.*, *khos*, *rabri*, etc., are used in larger quantities during winter; on the other hand, a much greater quantity of curd is used during summer, both as food and drink. The consumption of ice-cream also is mostly during summer months (April to July).

## (3) VARIATIONS DUE TO FESTIVALS AND FAIRS.

India is a land where festivals are observed with great frequency. The village, town or city goes into merry-making and feasting on such occasions most of which have a religious significance. Factories, offices and schools are closed and people join the holiday-crowds. Innumerable shops of all sorts, particularly of sweetmeats, spring up overnight to entertain the visitors, many of whom borrow money to enjoy the occasion. Even in villages, a few temporary stalls are put up for sweetmeats. All these shops make use of milk either in fluid form or as *khos*, curd or ghee. Similarly large fairs (*melas*) are held at places of pilgrimage where huge crowds, whose number at times exceeds a million, gather for some religious object *e.g.*, bathing in a sacred river or worshipping a deity at a particular time. Such gatherings occur generally for a week or even for longer periods. Temporary catering arrangements for

these vast assemblages have to be made, which considerably increase the demand for milk and milk products for a short period. Besides, many people observe fasts while attending such fairs and since the use of milk and its products has religious sanction even during the fasts, local consumption may temporarily be enormously increased.

#### F.—Dietary requirements.

The Nutrition Advisory Committee has drawn up a balanced diet\*, in terms of Indian dietary habits, which includes the consumption of 10 oz. of milk daily by adults. In the chapter on "The Problem of Nutrition"† while discussing the extent to which the population in India suffers from under—and mal-nutrition the Famine Inquiry Commission observe: "A large proportion of the population consumes a diet which fails to conform with standards put forward by nutrition workers, i.e., which does not contain protective foods in sufficient amounts. Among the poor sections of the community both urban and rural there is much under-nutrition as well as mal-nutrition." In a series of diet surveys carried out within recent years by nutrition research workers it was found that in typical urban and rural groups "x x the calorie intake of some 30 per cent. of families is below requirements and that even when the diet is quantitatively adequate, it is almost invariably ill-balanced, containing a preponderance of cereals and insufficient "protective" foods of higher nutritive value. Intake of milk, pulses, meat fish, vegetables and fruits is generally insufficient."‡ Quoting once again the Famine Inquiry Commission Report.\*\*

"The inadequacy of the present consumption of protective foods can be illustrated by quoting an estimate made by the Indian Council of Agricultural Research of the percentage increase in the production of various (protective) foods required to provide 'a suitably balanced diet' in minimum quantity for the 400 million people of India: Pulses by 20 per cent. vegetables by 100 per cent. milk by 300 per cent. fish meat and eggs by 300 per cent."§.

Experiments have shown that milk is the best of all supplements to cereal diets and the improvement in the health and development of Indian children which results from the regular intake of 8 to 12 oz. milk daily,

\*Composition of a balanced diet (Adequate for the maintenance of good health).

	Oz.		Oz.
Cereals .. .. .	14	Milk .. .. .	10
Pulses .. .. .	3	Sugar & jaggery .. .. .	2
Green leafy vegetables .. .. .	4	Vegetable oil, ghee, etc. .. .. .	2
Root vegetables .. .. .	3	Fish and meat .. .. .	3
Other vegetables .. .. .	3		No.
Fruits .. .. .	3	Eggs .. .. .	1

†Famine Inquiry Commission, Final Report, 1945.

‡Nutrition Advisory Committee, Indian Research Fund Association, March, 1944.

\*\*Famine Inquiry Commission Report, p. 108.

§Quoted from Memorandum on the Development of Agriculture and Animal Husbandry in India, by Indian Council of Agricultural Research (1944).

has been repeatedly demonstrated. The Famine Inquiry Commission further observe : "We are fully aware of these facts, as well as the importance of cattle in farm economy and of the advantages of 'mixed farming' whereby milch cattle contribute manure and add to the fertility of the soil. But looking at the problem realistically, we cannot visualize any immediate possibility of increasing the production of milk to such an extent that it can become a regular article of diet consumed in adequate quantities by the poorer classes of the greater part of India ; very reluctantly we conclude that the ideal set by nutrition experts—half a pound of milk or more daily for every child in the country—is not a practicable objective attainable within the next few decades. Every effort must, however, be made to increase supplies of milk products, and we regard this as a most important aspect of food policy. The more milk the better, even if all cannot be adequately supplied. x x x x".

"Imports of dried separated milk can to some small extent make up for deficient supplies within the country. We consider that the import of this valuable and relatively cheap protective food for distribution to children in schools etc., is fully justified. The manufacture of dried and condensed milk in limited areas in which the dairy industry is well developed is also to be recommended ; such milk could supplement supplies in areas in which milk is scarce\*."

"Before the war, dried skimmed milk from Australia and New Zealand was used quite widely in supplementing the diet of children in schools. It was in general cheaper than fresh milk locally produced and feeding experiments showed that it produced excellent results on the health and physique of children. Since milk supplies in India are inadequate there would be justification for encouraging the import of this valuable by-product of the Australian and New Zealand butter industry. It could, if available at a cheap cost, be used in school feeding†."

The foregoing pronouncements at once state our national target, the difficulties in the way of attaining the goal and an interim solution. In other words, they indicate what our national milk policy should be. "The nation can make no better investment than in milk for its children." For the interim period, i.e., till such time that dairy development schemes of the Central and Local Governments have sufficiently stepped up production of milk, resort may have to be taken to increased use of milk products like milk powder, condensed milk etc., to supplement the shortage. It is also clear that the "policy" should be implemented in stages. The first priority should be for growing children and expectant mothers. Next the labour classes getting subsistence wages in cities and towns should receive the benefits of the supply of cheap and wholesome milk. As much anxious attention should be given to the problems of increased milk production and supply if not more as the Central and Local Governments have been giving to the supply of cereals during the last few critical years, for it has to be realised that milk not

\* Famine Inquiry Commission. Final Report (1945), page 123.

† Note on Food and Nutrition Policy in India, by W. R. Aykroyd (1946).

‡ Mr. Winston Churchill.

only forms a supplementary food for the adult population but an essential food for about 25 per cent. of the youngsters of this sub-continent for which there is no proper substitute. Again the lee-way to be made in regard to the supply of the optimum *per capita* consumption of milk comes upto over 300 per cent. against about 30—40 per cent. deficit of some other food requirements.

### CHAPTER III—PRICES.

#### A.—General.

Raw milk has two prices—one which is realized when it is sold for fluid consumption and the other when it is sold for manufacturing purposes. There is always a marked difference in these two prices. As has already been seen in Chapter II, only about 36.2 per cent. of the milk production is consumed in fluid form and the remainder is converted into products. In India, the most important indigenous product—*ghee*—is manufactured by the producers themselves at their holdings, whence it is assembled, bulked and clarified by others before sending it to distant markets. Only the creameries and butter manufacturers purchase a small quantity of fluid milk from rural areas but the price paid by them for such milk is usually 50 to 60 per cent. or even less than that received by producers selling liquid milk for consumption in urban areas.

As long distance transport of fluid milk has so far remained practically undeveloped in India, the prices of fresh milk in one tract bear little or no relationship with those prevailing in other tracts. Local factors alone determine the price of milk, the most important of them being the type and dairy qualities of milch animals, amount of grazing available, supply and cost of fodder and other feeds, distance from areas of consumption and the cost of transport. Whether the producer sells to a wholesaler, to a retailer or acts as a retailer himself, delivers milk only once or twice a day, the time of delivery, *i.e.*, whether earlier or later than others, also appreciably influences the price in individual cases.

The demand for fresh milk is concentrated in the towns and cities. Milk for consumption in urban areas is partly produced locally and is partly obtained from the surrounding villages. The prices received by producers depend upon the intensity and elasticity of demand. The urban producers, because they can deliver milk earlier and in a fresher state, always secure a higher price than the rural producers. The cost of transport also in their case, is proportionately less.

It is generally observed that in areas where the cattle are of a better quality and the production is concentrated, supplies are greater and the milk prices are relatively low. This position is generally applicable to northern India. On the other hand, in the south and east, where the cattle are poor and production sparse, the milk prices maintain a correspondingly higher level.

In rural areas distant from towns and cities, there is practically no market for fluid milk. A small proportion is consumed by producers and their families and the remainder is made into *ghee*, butter or *khoa*. There the manufacturing price is of greater importance. Although the products are made in the villages their prices unlike those of milk

do not entirely depend on local conditions. Products can keep good for longer periods and can be transported to distant markets where their day to day prices are governed by various factors including competition with cheaper substitutes. The prices in terminal markets are regularly conveyed to the district collecting centres. The purchase of the products, in their raw or unrefined state, is made from the producers with these advices.

### B.—Units of sale and basis of price quotations.

Milk is always measured for sale but in most parts of India its price is quoted on weight basis. Prices are quoted by measures and the sales also take place on that basis only in some areas. Wholesale prices are usually quoted in seers or measures of known weight per rupee or in rupees per maund. For retail sales the prices are expressed in annas per seer, per viss or per lb. The last quotation is mainly used by dairies and farms.

The actual mass of the weight unit or the cubical contents of the measures are found to vary from tract to tract and also from place to place within the same tract. In some of the acceding States, the money units may also differ from those current in the provinces. In the same tract, one unit of weight or measure (generally a large one) may be used for purchasing milk from the producers and another may be used for selling it to the retailers or consumers. The same basis of quotation or unit of sale is used for cow milk, buffalo milk, mixed milk and goat milk in the same area.

The table below describes the position in different parts of Indian Union :—

*Units of sale and basis of price quotations.*

Area	Wholesale trade	Retail trade	Weights and measures in vogue.
<i>E. Punjab—</i>			
(a) Jullundur district.	Rupees per local maund.	Annas per standard seer	1 maund = 16 standard seers.
(b) Amritsar district	Rupees per <i>Lahoori</i> maund	Annas per standard seer.	1 <i>garvi</i> = 105 tolas. 40 <i>garvis</i> = 1 maund. In the towns, 1 <i>garvi</i> = 100 tolas.
<i>Saurashtra—</i>			
(a) Cutch	<i>Kalsia</i> per <i>kauri</i>	<i>Dhinglas</i> per local seer.	1 <i>kalsia</i> = 2½ local seers. 1 local seer = 22 tolas. At <i>Mandvi</i> , 1 seer = 20 tolas. At <i>Anjar</i> for taking milk from producers 1 <i>kalsia</i> = 3½ local seers, otherwise it equals to 3 seers. 7½ <i>kauries</i> = Rs. 1-14-0. 1 <i>dhinpla</i> = 1 picc. 1 <i>kalsia</i> = 5 local seers. 1 local seer = 40 tolas.
(b) Cambay	<i>Kalsia</i> per rupee	Annas per local seer.	
(c) Bantwa	Annas per 5 local seers	Annas per local seer.	1 seer = 40 tolas.

*Units of sale and basis of price quotations.*

Area	Wholesale trade	Retail trade	Weights and measures in vogue
<b>Cochin &amp; Travancore—</b>			
(a) General ..	Annas per <i>edan-gali</i> .	Annas per <i>nali</i>	1 <i>nali</i> = 12 fluid oz. 4 <i>nalis</i> = 1 <i>edangali</i> .
(b) Shencottah & Nagercoil areas.	Annas per <i>pakka padi</i> .	Annas per <i>padi</i>	1 <i>padi</i> = 27½ fluid oz. 2 <i>padis</i> = 1 <i>pakka padi</i> .
<b>Madras Province</b>	Annas per Madras measure or also local seers to a rupee.	Annas per <i>ollock</i>	1 <i>ollock</i> = 8 oz. 1 measure = 4 lb. Cuddapah 1 seer = 4 lb. Bellary 1 seer = 2-2/3 lb. Cuddalore 1 seer = 1 lb. Other places 1 seer = 2 lb.
<b>Central Provinces and Berar—</b>	Local seers to a rupee.	Annas per standard seer.	1 seer = 100 tolas.
<b>Bihar—</b>			
Muzaffarpur district.	<i>Lotas</i> to a rupee	Annas per standard seer.	1 <i>lota</i> = 1¼ standard seer.
Assam	Seers to a rupee	Annas per seer	1 seer in towns = 82 tolas. 1 seer in villages upto 120 tolas.
In other areas.	Rupees per standard maund or standard seers to a rupee.	Annas per standard seer.	Standard { 1 seer = 80 tolas. of 180 grains each. 40 seers = 1 maund.

It is evident from the foregoing table that a great deal of variation exists in the units of sale and in the methods of quoting the producers' price for milk in the different areas of the Indian Union. The Consumers' price is, however, quoted on a more uniform basis, *e.g.*, annas per seer. The disadvantages to which both producers and consumers are put to on account of the diversities in the methods of quoting producers' and consumers' prices and the use of weights and measures of varying denominations are too well known. It may be argued that fluid milk has no inter-provincial trade and, therefore, the local variations in weights and measures do not matter. But from the foregoing summary of conditions existing in different areas, it will be observed that the units differ widely in the adjoining districts of the same province, or acceding State and even in the same district.

It is also noticed that dealers, besides getting an advantage over the producers or the consumers through use of weights of different denominations, employ larger measures while purchasing milk and smaller ones for its sale. Baroda has reported that the purchase measure of the dealers is 10 to 12 per cent more than their sale measure. Near Lucknow, it was found that the milk measures employed by different collectors

were 10 to 15 per cent more than the weight on which prices had been settled. In Assam also the dealers are reported to purchase and sell milk by measures of differing capacities. Such instances are said to be common in all other areas also and point to the urgency of standardising the milk measures throughout the Indian Union. Such a step may result in a slight fall in the price but the producers are bound to gain through rate raising and the removal of this hardship would also result in inducing them to give up the temptation of adding water to the milk.

There is yet another factor to be considered. As already pointed out in the opening sentence of this section, the milk prices in Indian Union are quoted on weight basis but deliveries are made on measure. The milk measures in use are made on the basis of the volume occupied by a certain weight of water. Milk being a denser substance, it always weighs more than an equal volume of water. Some of the certified measures which are in use in certain parts of Saurashtra were tested and were found to hold 5 to 8 per cent more milk as compared with water.

The Bombay seer (liquid measure) prescribed under the Bombay Weights and Measures Act, 1932, is standardised on the basis of water.\* Since the same measure is used in the milk trade, it holds 3 to 4 tolas more milk by weight. The effect of this is that for every maund of milk which the producers sell they give an extra  $1\frac{1}{2}$  seers or approximately 4 per cent of the total value.

It is, therefore, essential that in order to have a comparable basis of price quotations for the milk trade in India, the milk measures be standardised. In the United Kingdom the producers deliver the milk by the Imperial gallon standardised on the basis of water but at the time of calculating the amount, a gallon of milk is taken to weigh 10.32 lb. and the payment is made accordingly. Hence the producers get correct payment on the basis of weight of milk supplied by them. A similar system can be followed in India also.

### C.—Factors affecting the price of milk.

The following five factors mainly determine or influence the price of milk :—

- (i) the type or milk, *e.g.*, cow, buffalo, mixed or goat,
- (ii) the purpose for which it is sold, *i.e.*, for fluid consumption or for manufacturing purposes,
- (iii) the distance of the producing centre from the place of consumption, on which depends the time of delivery,
- (iv) the intensity of demand in relation to supply, and
- (v) the elasticity of demand.

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\*The unit of capacity called the Bombay seer is equivalent to the volume occupied by 80 tolas of air-free distilled water weighed in standard Indian air against brass weights having a specific gravity of 8.143.

## (1) TYPE OF MILK.

Cow and buffalo milk may be marketed separately but often they are sold mixed. Goat milk may also be mixed with them, particularly in areas where it is produced in larger quantities. Thus, four types of milk are put on the market, *e.g.*, cow, buffalo, mixed and goat milks.

It is observed that in an area the prices of the four types of milk differ from one another but the extent of the variation is not the same in all tracts. Their wholesale prices, as received by urban producers for milk delivered to *halwais* and dairies for fluid consumption in the cities, are given in the table below. They are also applicable to the prices obtained by village collectors and producers who sell to similar buyers in the towns and cities. Averages of prices for the three regions which are discussed on pages 44 and 45 in the chapter on "Utilisation and demand" are also given.

*Wholesale prices received by urban and rural producers or collectors for delivery of raw milk to halwais and dairies in towns and cities for fluid consumption.*

(DATA RELATE TO 1947-48).

(IN ANNAS AND PIES PER SEER OF 80 TOLAS).

Area.	Cow milk.		Buffalo milk.		Mixed milk.	Goat milk.
	Price.	Average price for the region.*	Price.	Average price for the region.*	Price.	Price.
	As. p.	As. p.	As. p.	As. p.	As. p.	As. p.
Kashmir .. ..	3 2	3 2	4 6	4 6	4 0	6 0
East Punjab .. ..	3 0	3 6	3 4	4 7	3 3	2 3
Delhi Province .. ..	3 3		5 6		4 0	..
Saurashtra .. ..	3 6		4 0		3 9	2 4
Ba. od .. ..	2 9		3 10		3 8	1 0
United Provinces .. ..	3 6		4 0		3 10	2 6
Bihar .. ..	4 4		4 10		..	8 0
Bombay Province .. ..	6 0	5 8	6 8	6 6	6 6	3 0
Mysore .. ..	6 6		7 6		..	..
Cochin .. ..	6 8		7 2		..	6 8
Travancore .. ..	6 4		7 4		..	6 8
Madras Province .. ..	6 4		6 9		..	5 2
Hyderabad .. ..	5 4	5 6	5 4	6 8	..	4 0
Central Provinces and Berar .. ..	5 6		6 8		5 7	6 0
West Bengal .. ..	5 6	6 0	6 6	6 6	..	6 0
Assam .. ..	6 6		6 0		..	..
Indian Union (average) ..	4 6	..	4 10	..	..	4 6

\*See page 44.



(a) *Cow milk*.—Cow milk generally sells cheaper than buffalo milk except in Assam. In the last named province, it is stated that the higher price for cow milk is due to general disinclination to drink buffalo milk and the belief that the latter is less easily digestible than the former. Cow milk is cheapest in Baroda and dearest in Cochin.

(b) *Buffalo milk*.—On account of it being richer in fact content buffalo milk, wherever it is available in sufficiently large quantities, fetches a higher price than cow or mixed milk.

It is seen that in all the three regions it is sold at a higher price. The highest price is obtained in Mysore and the lowest in East Punjab.

(c) *Mixed milk*.—Although milk in this form is sold in all parts of the country, the bulk of the supplies from villages in the Indo-Gangetic plain consists of mixed milk. For obvious reasons, it sells dearer than cow milk and cheaper than buffalo milk. The difference between mixed milk and cow milk prices varies between 1 to 11 pies per seer depending upon the demand and the proportion in which the two milks have been mixed.

(d) *Goat milk*.—This type of milk is not generally sold as such for fluid consumption except in certain areas where its production is large. It is said that consumers object to its "goaty flavour" and its consumption for domestic purposes is confined to a comparatively smaller number of people. It is largely used at tea shops in Saurashtra. In tracts important for its production, its price is quite low and ranges between 1 anna to 1 anna 3 pies per seer. In other areas, it sells at a price equal to and at times even higher than that charged for cow milk. In some towns and cities, when it is sold for medicinal purposes or for feeding of infants under medical advice, fancy prices (up to 12 annas per seer) may be charged for it.

It has been shown on page 44 that the *per capita* consumption in the region consisting of Indo-Gangetic plain, including Rajasthan, Saurashtra, North Bombay and Baroda, is over one and a half times of the average *per capita* consumption of the country as a whole. From the foregoing table, it is observed that in the eastern and southern regions, where the production is sparse and the consumption is much below the average for the country, the prices are higher by 42 to 70 per cent than those in the northern region, which has the highest *per capita* consumption in Indian Union. Thus it seems reasonable to expect that the *per capita* consumption in areas where it is low at present could be increased by reducing the price of milk. It has already been indicated that this could be done by concentrating the production in villages near centres of consumption, better feeding and management of cattle and evolving an efficient system of distribution.

## (2) PRICE OF MILK SOLD TO MANUFACTURERS.

It has already been stated that the premier dairy produce—*ghee*—is made not in large factories but at the holdings of the producers on a

small scale. *Khoa* also is made generally in the same way. Curd is as perishable as milk and it is made by the *halwais* or producers in small lots. Thus there is no demand for fluid milk from factories and others for manufacturing purposes as is the case in foreign countries. The only instance of the existence of such a demand is from the cream and butter manufacturers, who purchase milk in large lots in certain tracts. This is done in rural areas from where, under the present conditions, it is difficult to transport milk to urban centres for liquid consumption. The total purchases, however, do not exceed 1.5 per cent. of the Indian production. The following table gives the average price of such supplies in some of the important butter-making tracts. The prices of milk for fluid consumption are also given for comparison.

*Comparative prices of buffalo milk for fluid consumption and for manufacturing cream or butter.*

Area.	Wholesale price for fluid consumption in urban area. (Per maund).	Price paid by manufacturers. (Per maund)	Percentage of column (3) to column (2).
(1)	(2)	(3)	(4)
	Rs. A. P.	Rs. A. P.	
Baroda (Petlad area)	9 4 0	5 8 0	60.0
Bombay Province (Nadiad area)	10 0 0	3 12 0	37.6
North Bihar	11 4 0	6 0 0	53.3

It is seen that the price paid by manufacturers in these three areas is only 38 to 60 per cent. of the fluid milk prices obtained in towns and cities. The manufacturers in Nadiad district obtain their supplies of milk at the cheapest rate compared with others. This is due to the fact that this district is highly specialised in the production and supply of milk for manufacturing purposes. Unlike producers in other tracts who do not even know what a fat test is, the producers in this area are accustomed to sell milk to creameries on the basis of fat-content which is declared once a week on results of composite tests. Casein making has also developed considerably in this area. On the other hand, no attempt has been made on behalf of producers to organise the sale of any part of their output as fluid milk with the result that its supplies are short and although the manufacturing price in this area is lowest, the price for fluid milk is quite high. This position, therefore, suggests that too much dependence on manufacturing outlets alone in any area should be avoided and that in such areas a part of the village supplies should be bulked and transported to nearby centres for fluid consumption, to enable producers to obtain the maximum returns.

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### (3) EFFECT OF DISTANCE BETWEEN PRODUCING AND CONSUMING CENTRES ON PRICES.

Distance adds to the cost of transport and limits the area covered by a centre of supply. But in case of raw milk, there are two other factors which restrict long distance transport. These are (a) the risks of spoilage in transit from places which are farther away, and (b) the question of not receiving the milk in time for early delivery to consumers. In other words, a producer who is situated near a consuming centre can send in the milk earlier, in a fresher state and incurring less cost on transport with less chances of spoilage than one in a distant village. In this respect, the urban producers are naturally able to get the maximum prices by being on the spot. They are able to supply fresh milk, at times drawn under supervision, much earlier than others and thus help the retailers to cater for consumers who want their supplies early in the morning or evening, and are prepared to pay a little extra for it. The natural corollary to this is that quantities which arrive later are sold at a discount.

It has to be mentioned here that it is not known if the premium in price which the urban producers get covers the extra cost involved in paying high stable rents, increased cost of feeding, more expensive labour charges and frequent replenishment of cattle. Unfortunately, no study on comparative costs of production of milk under different conditions has been made in this country to answer the above point. But a preliminary examination shows that the cost of production in the rural areas is less and even if the additional cost of transport is taken into account, this milk could be delivered cheaper than that produced in the cities. Cleaner production of milk under natural conditions, greater scope for expansion and relieving the cities of insanitary cattle stables are additional features which should favour the production of milk in the rural areas placed within reasonable distance from the cities.

It is found that with respect to supplies to all urban areas, the producer's price gets progressively reduced according as the distance of the producing village increases from the consuming centre, and after about 15 miles—the distance that a *tonga* can cover in about 2 hours—the zone for marketing fluid milk ends and producers have no alternative but to make ghee on the holdings and sell it in due course. In a later section (see page 99) it will be seen that in the co-operative organizations that are being set up for increasing supplies of milk to urban areas are arranging to collect milk from villages between 12 to 30 miles from the consuming centres, this distance being easily covered by a motor truck within two hours.

### (4) PRICE AND INTENSITY OF DEMAND.

One of the factors which affects the price of milk is intensity of demand in relation to supplies. Generally, the demand in larger towns

and cities is more intense than in smaller towns. The table below deals with the prices of milk in towns and cities of different sizes:—

*Prices of (mixed) milk in towns and cities.*

(DATA RELATE TO 1947-48).

IN ANNAS PER SEER.

	From	To		From	To
	As. P.	As. P.		As. P.	As. P.
Delhi .. ..	8 0	10 0	Cuttack .. ..	6 0	7 0
Bombay .. ..	13 0	15 0	Nagpur .. ..	6 0	7 0
Poona .. ..	12 0	13 0	Lucknow .. ..	5 0	6 0
Nadiad .. ..	5 0	6 0	Calcutta .. ..	10 6	13 0
Madras .. ..	7 0	9 0	Jullundur .. ..	8 0	9 0
Tiruchirappalli ..	6 0	7 0	Karnal .. ..	5 6	6 0

Bombay, Poona, Madras, Nagpur, Lucknow, Delhi and Calcutta, although not of the same size, are the premier cities of the provinces in which they are situated. They are important civil and military stations and commercial centres and possess a large number of hotels and restaurants. The purchasing power and standard of living of the people is high. Consequently, the demand for milk is more intense. It is met partly by maintaining animals within the cities at high costs and partly by obtaining supplies from places outside. Absence of proper transport facilities prohibits exploration in distant producing areas, and thus limits the available supplies. The prices, therefore, are high compared with smaller towns where the factors of supply and demand balance themselves more readily.

The price of milk also depends upon the part of the day, *viz.*, morning or evening, at which it is needed most. In some places, the demand is more intense in the morning than in the evening or *vice versa*. Higher prices are, therefore, paid when larger quantities are in demand. If cold storage facilities were available cheaply, raw milk at such places could be stored (at about 45°F) during the day or over-night as the case may be, in order to stabilise the prices and obtain a better return for the producers.

(5) PRICE AND ELASTICITY OF DEMAND.

The distributors generally enter into contracts with producers for the supply of their expected regular sales. However, in each town and city, some milk which is not already contracted for is available every day. For various reasons, the quantities differ from day to day and from morning to evening. Accordingly, the prices also vary.

Data relating to daily variations in price of milk in different markets are not available. In connection with a "Cattle News Service" such information was recorded for 1939 in Bombay. The weekly averages are reproduced in the table below and a graphic illustration appears opposite this page.

*Weekly prices of uncontracted supplies of milk at Bombay during 1939.*  
(PER MAUND).

Month.	1st week.	2nd week.	3rd week.	4th week.	Monthly average.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
<b>1939.</b>					
January .. ..	..	..	6 7 0	6 6 0	6 6 0
February .. ..	7 6 0	8 0 0	7 0 0	6 9 0	7 4 0
March .. ..	8 2 0	7 9 0	8 0 0	9 12 0	8 6 0
April .. ..	8 10 0	8 7 0	9 14 0	8 5 0	8 13 0
May .. ..	8 8 0	8 4 0	6 8 0	8 8 0	7 15 0
June .. ..	11 13 0	10 15 0	8 12 0	10 12 0	10 9 0
July .. ..	7 1 0	8 4 0	7 10 0	7 7 0	7 9 0
August .. ..	7 13 0	11 2 0	7 11 0	7 12 0	8 10 0
September .. ..	9 10 0	9 0 0	7 6 0	9 3 0	8 13 0
October .. ..	10 15 0	12 9 0	12 1 0	8 15 0	11 2 0
November .. ..	11 7 0	13 14 0	10 15 0	9 0 0	11 5 0
December .. ..	9 9 0	10 1 0	9 13 0	9 9 0	9 12 0

The foregoing prices show very erratic fluctuations from week to week and indicate that in markets, where milk is generally purchased by dealers under contract, the price of the uncontracted supplies are influenced to considerable extent even by relatively small fluctuations in supplies. The foregoing data refer to the prices declared by the trustees of Bombay Milk Market.

Increased demand during festivals also causes very erratic fluctuations in milk prices but they do not occur every day and their effect is only temporary. However, the variations caused by them are very great and bear no comparison to the normal variations in prices.

#### **D.—Note on malpractices prevalent in regard to milk prices.**

The use of larger measures than those stipulated in the sales contract by collectors, wholesalers and retailers in taking deliveries from

the producers have already been discussed in the section on "Basis of price quotations and units of sale". This gives the producers an incentive to adulterate the milk rather than sever their connections with the buyers. In the long run, this results in the general lowering of prices. Even those who wish to sell genuine milk have also to follow the practice of adulteration in order to keep in line with the market.

The measures being not standardised, the consumers, thinking that they may be short, always reasonably or unreasonably demand extra milk from the retailers, which the latter have to give with a view to keeping the former pleased. This practice is so widely prevalent that there is no need on the part of the retailers to keep correct measures. Only a few retailers and consumers unfortunately believe in better quality and higher prices. Many of the retailers claim that they have to adulterate the milk because the consumers want cheaper milk. One of the reasons why there is more demand for buffalo milk from retailers is that it is richer in milk solids and can be adulterated with water with less chances of detection.

In towns and cities, when there is a special demand for cow milk and it cannot be readily obtained, the retailers attenuate the buffalo milk with water and sometimes are also said to add a little colour to give it the characteristic yellow tinge of the cow milk. In this manner, they make more profit than by supplying cow milk itself.

In large cities like Bombay and Calcutta, the demand is high relative to the supplies. In such places, cheap reconstituted skimmed milk may be added to genuine milk in order to maintain the density and yet to have more profit. Sometimes, especially at the time of festivals, reconstituted skimmed milk is passed on as whole milk.

With most of the petty dairies and small retailers, it is observed that in order to secure business they give tips to the customer's servants and make the margin for it by supplying adulterated and poor quality milk. It is unfortunate that this practice is at times noticed even at institutions, *e.g.*, hospitals, where the charge of receiving the milk is in the hands of a subordinate person. It is obvious that larger dairies who do business on strictly honest and commercial lines cannot resort to such a practice and are often unable to procure the orders.

All the above factors tend to cheapen the price and bring dishonesty into the milk trade. Education of the persons engaged in the milk trade and of the people at large can alone remedy these defects.

### **E.—Price of milk according to type and quality.**

#### **(1) ACCORDING TO TYPE.**

The four main types have already been discussed in a previous section. Besides these, there are other types and classes under which the milk is put on the market. As their importance varies according to areas and as at places they do not appear on the market at all, only

their price ranges are given for the country as a whole in the table below :—

*Price ranges according to types.*

(DATA RELATE TO 1947-48).

Type.	Retail price per seer.	
	As. P.	As. P.
<i>(a) Milked under consumer's supervision —</i>		
Cow milk .. .. .	7 0	to 14 8
Buffalo milk .. .. .	8 6	to 15 0
<i>(b) Bazaar milk—</i>		
Boiled, mixed, unsweetened .. .. .	6 6	to 11 0
Boiled, mixed, sweetened .. .. .	7 0	to 12 0
Skimmed, raw .. .. .	1 6	to 2 6
<i>(c) Dairy farms—</i>		
Farm produced cow milk .. .. .	8 0	to 10 0
Farm produced buffalo milk .. .. .	9 0	to 12 0
Village milk, standardised and bottled .. .. .	7 6	to 8 6
Farm produced, pasteurised and bottled .. .. .	9 0	to 14 0
Farm produced, pasteurised, loose .. .. .	7 0	to 9 0

It is observed that the price of milk supplied by farms is generally higher than that of the bazaar milk and the average consumer, therefore, prefers to purchase in the bazaar.

The price of boiled milk is about 25 per cent. more than raw milk. Enquiries show that a reduction of about 12 to 15 per cent. in volume occurs during heating the milk and keeping it on fire till such time as the entire quantity is sold out. The sellers have also to spend some amount on fuel.

(2) ACCORDING TO QUALITY.

Although the price varies in direct relation to quality of milk, yet no definite relationship could be established between the two. Milk arriving late, although quite fresh sells at a cheaper rate than milk arriving early. Milk of the previous evening brought to the market the following morning has a different price. Milk coming from villages renowned for better feeding of cattle may realise better prices although actually there may be no difference in quality. Several such peculiarities are noted at each market and, due to empirical methods that are employed by producers, collectors, retailers and consumers in almost every aspect of the milk trade, a representative table could not be drawn up.

### F.—Comparison of world and Indian prices of fluid milk

The retail prices of fluid milk in selected countries abroad, converted in terms of seers and Indian currency, for the year 1938 and 1947 are given in the following table. The figures in column (6) show 1947 prices as percentage of 1938 prices in the currency in use in the respective countries :—

#### *Retail prices of milk in selected countries.*

1	Price in 1938		Price in 1947		1947 prices as col. (4) as percentage of 1938 prices at col. (2)
	Per litre in local currency.	Indian equivalent in annas per seer.	Per litre in local currency.	Indian equivalent in annas per seer.	
2	3	4	5	6	
United Kingdom ..	6.2 pence	5.0	8.0 pence	6.4	129
Ireland ..	5.0 pence	4.0	6.0 pence	4.8	120
Netherlands ..	13.0 cents	5.2	19.2 cents	7.6	148
Switzerland ..	0.34 franc	4.2	0.44 franc	5.3	129
Sweden ..	25.0 öre	2.5	33.5 öre	4.5	134
Denmark ..	35.0 öre	3.1	46.0 öre	4.7	131
United States of America ..	14.7 cents	5.8	17.5 cents	6.9	119
Canada ..	9.9 cents	3.9	13.6 cents	5.3	137
New Zealand ..	5.7 pence	3.6	6.25 pence	4.1	110
<i>Indian Union</i>					
(a) Cow milk (average raw) ..		2.4	.. ..	10.0	414
(b) Pasteurised milk ..		5.0	.. ..	12.0	240

Source.—F.A.O. Bulletin on dairy products for February, 1948 except prices in the Indian Union.

It will be observed that the prices in India during 1947 were the highest in the World. This has been so for the past several years.

In the countries abroad, the retail price is high on account of the high costs of processing, bottling and distribution. For instance, it has been shown that in England and Wales, the cost of the above services worked out to nearly 40 per cent. of the consumers price in 1939. The Indian conditions of handling and distribution do not stand any comparison with those prevalent in foreign countries. During 1938, when milk prices in India were generally low, pasteurisation and distribution in bottles was costly and the price of pasteurised milk was almost double



that of raw market milk. During 1947, pasteurised milk, while more dear than raw milk by a fifth of the price of the latter, had registered a net increase of 140 per cent. over 1938 prices as against 314 per cent. in the case of raw milk. This bears testimony to the integrity and possibility of the organised distributive trade in milk in this country which normally raise prices only to meet the rise in the cost of production and processing charges.

### G.—Seasonal variations in prices.

#### (1) GENERAL.

The seasonal variations in the production of cow and buffalo milk are discussed on pages 23 to 26. Similarly, variations in demand are discussed on pages 59 to 61. Their combined influence results in periodic fluctuations of the prices of milk. Other factors which directly influence the seasonal variations in prices are increased cost of maintaining milch or dry cattle during summer months, bad state of roads connecting the villages with towns during the rainy season, late monsoon or its failure in an area, outbreak of cattle diseases and migration of milch animals in search of grazing.

In the fluid milk trade, there are distinctly three seasonal price fluctuations, *e.g.*, during summer (March to June), monsoon (July to October) and winter (November to February). It may be mentioned here that due to the vastness of the country and geographical considerations, the summer, monsoon and winter seasons do not occur in all the parts at the same time. The months indicated above are, therefore, only approximate and are more applicable to plains of north India than to the tableland of the peninsula, coasts or extreme south.

During the three seasons, irrespective of when they occur, the conditions undergo marked changes and the milk prices are affected. The summer season is most unfavourable from several points. The yield goes down and the cost of production goes up. Comparatively more dry animals have to be maintained and due to the severity of the weather, supplies from distant villages have to be given up. Monsoon is a favourable period for the producers. The cattle commence to calve in large numbers and grazing is generally plentiful. Feeding of concentrates is practically discontinued and the producers are able to repay a substantial part of their loan during this time of the year. However, transport difficulties and lesser demand for fluid milk deprive the producers from enjoying the full advantage of the boom resulting from Nature's blessing. During winter season production and demand are more equitable but the animals are to be well fed and looked after in order to maintain the high standard of quality which is expected of them at this time of the year.

Generally speaking, on account of the above reasons, the cost of milk or its price is highest in summer, lowest during monsoon and maintains an average level during winter. In many parts of the country, therefore, the collectors, distributors or retailers of milk enter into contracts with the producers for the supply of milk, at rates which vary

according to the three seasons. Where the variations are not quite marked the rates may change only twice a year and the monsoon period may be linked up with summer. On the other hand, in spite of these variations, annual contracts may be made as is the case in Bihar. In Delhi, the contract for supplies during summer is made at the time of *Holi*, a Hindu festival, which generally occurs in March. Soon after the break of monsoon in the beginning of July, the contract is revised for supply during the rainy season. At *Diwali*, another Hindu festival which falls at the end of October, the rates for winter supplies are settled. These contracts are technically called *bundis* or *bands* in Hindustani. In general, some kind of contract system is prevalent all over the country in order to ensure supplies to the consumer and a ready market to the producers. Purchase of milk without contract is called *khulla vohar*.

In a country like India, where the peasantry leads a hand-to-mouth existence, this practice—the fixation of prices in advance—is a very desirable one from the producers' point of view as he is guaranteed a definite income and is able to plan his expenses accordingly. Advances are also given to producers at the time of changing the contract in order to keep them morally bound for the fulfilment of their promise.

It is necessary to point out here that only the producers' prices undergo these periodic changes. The retail prices seldom rise or fall except momentarily during festivals, etc. On such occasions or rushes, the demand is partly met by adulterating the milk and partly by raising the prices. Due to scarcity of the supplies on these occasions, the consumers become rather indifferent to quality. But even at such times the prices of regular customers are not raised. The dairies and farms always have a uniform price throughout the year.

Another fact which deserves special mention is that the retail prices, which remain unchanged throughout the year, are fixed by the distributors generally on the basis of maximum price paid to the producers. Thus the advantage accruing from the lower wholesale prices of milk in certain seasons goes entirely to the intermediaries.

## (2) Cow MILK.

Except in two provinces *viz.*, Bihar and West Bengal, cow milk is sold mixed with buffalo milk and its demand is comparatively small. For the feeding of children, however, it is given a preference over other milks in most parts of the country.

It will be seen from Chapter I that the production of cow milk is highest during two periods, *viz.*, March|April and December|January. It is lowest from June to August. The maximum price of cow milk is generally obtained during the monsoon months when the animals that have calved in the early part of the year are at the tail end of their lactation. The minimum price is reached during the winter months

when the yield is at its maximum. The seasonal variations for a few areas are given in the table below :

*Seasonal variations in cow milk prices.*

	Wholesale price per maund.			Percentage variation from winter prices.	
	Summer. (March— June).	Monsoon. (July— Oct.).	Winter. (Nov.— Feb.).	Summer.	Monsoon.
	Rs. A. P.	Rs. A. P.	Rs. A. P.		
Kashmir .. ..	6 9 0	.. ..	7 14 0	(—)16.7	..
Baroda .. ..	7 0 0	7 6 0	6 14 0	(+) 1.8	(+) 7.1
Bombay .. ..	20 0 0	15 0 0	15 0 0	(+)33.3	..
Bihar .. ..	12 4 0	11 6 0	10 13 0	(+)13.8	(+) 5.0
W. Bengal .. ..	12 13 0	16 7 0	13 12 0	(—) 6.6	(+)19.7

It is observed that in Kashmir the prices in winter are higher than in summer. This is due to the fact that winters are extremely cold in that region and production of milk is considerably reduced. The maximum production is attained during early summer when the price is the lowest. In Bombay, the production is highest in September and October and low during summer. This accounts for the high prices during the warmer months. In West Bengal, the maximum price occurs during the monsoon although these are not the months of least production. The reason for this is stated to be the increased transport difficulties on account of the heavy inundations which occur in most parts of the province during this part of the year.

(3) BUFFALO MILK.

Buffalo milk is in demand both for fluid consumption and for the manufacture of products, *e.g.*, cream, butter, *khoa*, etc., outside the holdings of the producers. Its production is the least during the summer and early monsoon months and is maximum in the latter part of the rainy and in the winter seasons. The table below gives the seasonal prices of buffalo milk in some parts of Indian Union.

*Seasonal variations in buffalo milk prices.*

	Wholesale price per maund.			Percentage variation from winter prices.	
	Summer. (March— June).	Monsoon. (July— Oct.).	Winter. (Nov.— Feb.).	Summer.	Monsoon.
	Rs. A. P.	Rs. A. P.	Rs. A. P.		
Kashmir .. ..	9 10 0	.. ..	11 4 0	(—)14.3	..
East Punjab ..	8 14 0	8 1 0	8 5 0	(+) 6.5	(—) 3.2
Baroda .. ..	10 12 6	10 8 0	9 9 0	(+) 2.5	(+) 9.7
Rajkot .. ..	13 10 0	11 3 0	10 0 0	(+) 36.5	(+)11.8
Bombay .. ..	20 14 0	12 10 0	16 10 0	(+)25.4	..
Bihar .. ..	13 9 0	12 6 0	12 1 0	(+)12.6	(+) 2.8

It is observed that the maximum price is generally obtained during the summer season and the lowest price during the flush months which partly fall in the monsoon and partly in the winter season. In Kashmir, the maximum is reached during winters on account of the same reasons as described under cow milk. The minimum prices in Baroda, Rajkot and Bombay occur during the winter season, whereas in the East Punjab and Bihar, this happens during the monsoon months. This is explained from the buffalo milk production calendar which appears on page 24. It is seen from there that highest production in the former tract occurs slightly later than in the latter tract and correspondingly fluctuations take place in the seasoned price.

#### (4) MIXED MILK.

Most of the market milk is mixed milk, mainly of cows and buffaloes, but occasionally goat milk may also be mixed in certain parts. The seasonal variations in its prices take into account the seasonality of milk production from these animals. The following table gives the summer, monsoon and winter prices of mixed milk in some of the areas in the Indian Union.

*Seasonal variations in the price of mixed milk.*

	Wholesale price per maund.			Percentage variation from winter prices.	
	Summer. (March— June).	Mon. son. (July— Oct.).	Winter. (Nov.— Feb.).	Summer.	Monsoon
	Rs. A. P.	Rs. A. P.	Rs. A. P.		
Delhi .. ..	10 12 0	8 7 6	10 0 0	(+) 7.7	(-) 15.4
Baroda .. ..	10 7 0	10 11 0	9 3 0	(+) 13.9	(+) 16.7
Bombay .. ..	14 3 0	14 3 0	12 8 0	(+) 13.4	(+) 13.4
Surat .. ..	12 14 0	12 8 0	12 8 0	(+) 3.0	..
Hyderabad ..	15 4 0	13 5 0	13 5 0	(+) 14.7	..
Calcutta .. ..	10 13 0	13 6 0	12 8 0	(-) 13.3	(+) 7.1

It is observed that in all the areas except West Bengal, maximum prices for mixed milk are obtained during the summer season. This is due to the fact that the milch animals are at the tail end of their lactation. On account of scarcity of green fodder during this part of the year, the cattle are mostly stall-fed and this adds to the cost of production of milk and raises its price. Most of the milk produced in West Bengal is cow milk and its maximum production is reached in April-May. Consequently, the summer prices are the lowest with a maximum during the monsoon season.

The period for maximum prices shows a greater variation and in some parts it is reached in the monsoon season and in others during the winter, depending upon the season of maximum production and low demand. In Delhi, although the supplies are greatest during the winter months, yet the minimum price is reached during the monsoon.

## (5) GOAT MILK.

Goat milk is quite unimportant in the fluid milk trade. Except in certain areas, *e.g.*, parts of the East Punjab and Saurashtra, it is not sold regularly. In these areas, goat milk is cheaper during April-May and December-January, *i.e.*, nearly two months after the kidding seasons, when the production is highest. In Patiala, the prices are the lowest during March and April.

Goat milk is often converted into products, *e.g.*, *khoa* and *ghee*. In June, the goats move to the hills in search of grazing and remain there till October. The seasonal migration of goats also affects considerably the seasonal prices of milk and products.

## H.—Trend of milk prices.

The milk trade in the country is mostly in the hands of petty dealers who do not maintain old records. The few dairies and farms which cater to a select clientele do not generally sell in wholesale : their retail prices are high and do not generally bear much relationship to the price variations that have taken place in the country as a whole. It has not been possible to collect reliable data from the trade in general, over a series of years.

The following table shows the prices paid by milk co-operative Societies and unions for milk purchased from their members from 1938-39. The figures will give some idea of the trend of milk prices in urban areas.—

*Prices paid for one maund of milk by certain Co-operative Societies and Unions.*

Years.	Lucknow.		Nagpur.		Hubli.		Madras.		Coimbatore.		Choriyasi.	
	Price	Index No.	Price	Index No.	Price	Index No.	Price	Index No.	Price	Index No.	Price	Index No.
	Rs. A.		Rs. A.		Rs. A.		Rs. A.		Rs. A.		Rs. A.	
1938-39	3 5	100	5 15	100	5 12	100	6 10	100	5 7	100	..	..
1939-40	3 5	100	5 15	100	5 6	93	6 11	101	5 7	100	..	..
1940-41	3 11	110	5 15	100	5 6	93	6 7	97	5 7	100	6 6	100
1941-42	4 0	120	5 15	100	6 4	109	8 1	121	5 7	100	7 5	115
1942-43	4 7	133	8 0	125	7 6	128	9 8	143	10 7	192	10 3	160
1943-44	7 4	217	10 15	184	13 9	236	13 7	22	16 4	30	14 7	226
1944-45	9 14	267	10 15	184	16 6	285	16 10	251	16 4	300	15 10	305
1945-46	9 14	267	12 8	211	16 6	285	18 6	26	16 4	300	23 7	368
1946-47	11 7	343	12 8	211	16 6	285	21 14	230	20 0	363	25 10	402
1947-48	13 6	401	12 8	211	..	..	..	..	..	..	..	..

It will be observed that although milk prices have been on the increase from 1936-39, a sharp and pronounced rise occurred in 1943-44, when prices nearly doubled in some areas. It may be stated the prices of all foodstuffs and consumers goods registered such a sharp rise during this year. The cost of production of milk went up owing to increase in prices of milch stock, high maintenance cost of the animals, etc. The producers put up their prices which naturally affected prices paid by middlemen and the ultimate consumers.

Milk prices have still (1948) not taken a downward trend. The population in towns and cities is still on the increase and consequently there are no early prospects of a reduction in prices of milk in urban areas.

### **I.—Producers' share in the price paid by consumers.**

#### **(1) GENERAL**

It will be seen in Chapter IV that, generally, there are two intermediaries between the producer and consumer. One is the collector who assembles milk from villages and the other is the distributor who delivers it to consumers. In some cases, the producers deal directly with the distributors or even with the consumers. Thus at times, one or both the intermediaries disappear.

For comparing the spreads of milk price in different areas, three categories have been considered. The first is the price received by the producer when he sells milk to the collector at his village holding. This is called "producer's price". The second is "collector's price" at which he delivers milk in wholesale to the retailers in the town. This is the same as "wholesale price". The third is the "retail price" which is paid by consumers. All the prices are for raw whole milk.

The prices received by urban producers have not been shown separately in the price spreads. Their prices are generally equal to those received by collectors when selling in wholesale to distributors. In the retail trade, the urban producers are able to secure from the consumers the same price or at times even more than what the consumers pay to the retailers.

Separate discussions on the price spreads in different areas for the four types of milk follow. In each section a table is given which shows the price from the rural producer to the urban consumer. It may, however, be pointed out that in the face of numerous variations, seasonal, regional and individual, it is difficult to prepare a set of tables that would satisfy all the factors and conditions of trade. The figures given in the tables are only averages but are applicable to a major portion of the trade in the towns and cities situated in the areas that have been studied for this purpose. As far as possible, the towns have been selected to represent average conditions in the tract. The tables, in other words, do not cover exceptional cases. It has already been seen that the basis of quotations is different in many areas, but for the purpose of comparison all prices are reduced to a standard basis, i.e., annas per seer.

The position in India as a whole may be summarised as under with regard to price spreads for the different types of milk:—

*Prices spreads for different types of milk.*

Type of milk.	Pro- ducer's price per seer.	Collec- tor's price per seer.	Retail- er's price per seer.	Percentage of retailer's price received by :		Percentage margin.	
				Pro- ducers.	Collec- tors.	Retail- er's.	Collec- tor's.
	As. p.	As. p.	As. p.				
Cow .. .. .	6 4	8 6	10 0	63	85	15	22
Buffalo .. ..	6 11	9 0	10 7	65	85	15	20
Mixed .. .. .	5 3	6 9	8 11	59	76	24	17
Goat .. .. .	6 3	..	8 10	71	..	29	..

It is seen that, on an average, the producers get about two-third of the price paid by consumers. The remaining one-third is divided between the two functionaries, viz., the collectors and retailers. The proportions kept by the collectors generally depend upon the distance and the extent of difficulties which they may experience in obtaining a quantity of milk per day. On the other hand, the retailer's margin depends upon local factors such as the quantity of milk handled by him per day, selling competition, overhead charges, etc. The figures given do not take any account of differential measures commonly used for buying and selling or of the wide-spread practice of adulteration.

(2) PRICE SPREADS OF COW'S MILK.

The table below gives the producer's, wholesaler's and retailer's prices for cow's milk in certain areas of the Indian Union. A diagrammatic representation of the same appears opposite page 73.

*Price spreads of cow milk.*

Area.	Pro- ducer's price per seer.	Collec- tor's price per seer.	Retail- er's price per seer.	Percentage of retailer's price received by :		Percentage margin.	
				Pro- ducers.	Collec- tors.	Retail- er's.	Collec- tor's.
	As. p.	As. p.	As. p.				
Cochin .. ..	8 8	12 7	12 7	61	93	7	29
Travancore ..	9 1	11 3	12 3	71	92	8	18
Bihar and Orissa ..	6 6	8 8	11 0	59	79	21	20
Central Provinces & Berar ..	6 1	9 8	10 4	59	91	6	35
Kashmir .. ..	4 10	6 9	8 5	58	81	19	23
West Bengal ..	5 9	7 8	9 0	64	86	14	22
United Provinces ..	5 10	6 9	8 8	67	78	22	11
East Punjab ..	4 10	5 9	8 5	58	69	31	11
Assam .. .. .	6 6	8 0	8 5	77	93	4	10
Barda .. .. .	3 2	5 5	6 5	50	85	15	35
Average .. ..	6 4	8 6	10 0	63	85	15	22

It is observed that the proportion of the consumer's price received by the producer varies between 50 per cent. in Baroda and 77 per cent. in Assam. It is further seen that the collector's margin is proportionately more in areas of scanty or scattered production, *e.g.*, Cochin, Travancore, the Central Provinces and Berar and Assam. For instance, in the Central Provinces and Berar, where the daily production per village is only 27 seers per day or 9 seers per square mile (*see* table in "Collection, treatment and distribution" chapter on page 91), the collector's margin is 35 per cent. compared with the retailer's margin of 6 per cent. only.

In East Punjab and the United Provinces, where the production per village or per square mile is high, the retailer's margin is much higher than that of the collector and the producer also gets proportionately less for his milk than in areas where supplies are sparse. In East Punjab, where the production per square mile is high, *viz.*, 4 maunds 15 seers (*see* table on page 91) it is easier for the collectors to assemble the milk and, therefore, their margin is only 11 per cent. compared with 31 per cent. of the retailer. In areas, where the production is more equitably distributed or the demand for a particular type of milk for fluid consumption is more pronounced than others the margins of the two functionaries are almost equal, *e.g.*, in Bihar in the case of cow milk.

### (3) PRICE SPREADS OF BUFFALO MILK.

The table below gives the information available in regard to buffalo milk and a diagrammatic illustration based on the data is given on opposite page 73.

*Price spreads of buffalo milk.*

Area.	Pro- ducer's price per seer.	Collec- tor's price per seer.	Retail- er's price per seer.	Percentage of retailer's price received by:		Percentage margin,	
				Pro- ducers.	Collec- tors.	Retail- er's.	Collec- tor's.
	As. P.	As. P.	As. P.				
Cochin .. .. .	10 0	13 5	14 5	69	93	7	24
Travancore .. .. .	9 4	13 0	14 0	66	93	7	27
Madras province .. .. .	8 3	9 3	11 3	73	82	18	1
Bihar and Orissa .. .. .	6 3	8 9	10 6	59	83	17	24
Assam .. .. .	6 9	8 9	10 6	55	83	17	25
Central Provinces and Berar .. .. .	6 6	10 0	10 6	62	95	5	32
West Bengal .. .. .	6 0	8 9	10 6	64	83	17	19
East Punjab .. .. .	5 6	7 0	9 3	59	76	24	17
United Provinces .. .. .	5 9	7 0	8 9	77	80	20	3
Kashmir .. .. .	5 6	6 9	8 9	63	77	23	14
Baroda .. .. .	4 6	6 4	7 3	62	87	13	25
Average .. .. .	6 11	9 0	10 7	65	85	15	20



The general remarks made in connection with cow milk also apply to buffalo milk. It is observed that in Cochin, Travancore, Central Provinces and Berar and Assam, the margins of the collectors compared with those of retailers are again high. However, in Madras Province, the collector's margin is less because supplies of buffalo milk are more readily available nearer the towns than cow milk. In West Bengal, although buffalo milk is produced only in small quantities, the margins of the two functionaries are equal. This is due to the fact that production of this type of milk is concentrated near towns and the collectors can assemble it with ease.

#### (4) PRICE SPREADS OF MIXED MILK.

The available data pertaining to this type of milk are summarised in the following table and are illustrated diagrammatically in the illustration appearing opposite page 73.

*Price spreads of mixed milk.*

Area.	Producers' price per seer.	Collector's price per seer.	Retailer's price per seer.	Percentage of retailer's price received by :		Percentage margin.	
				Producers.	Collectors.	Retailers.	Collectors.
	As. p.	As. p.	As. p.				
West Bengal .. .. .	3 9	7 9	10 6	64	74	26	10
Delhi .. .. .	5 9	7 0	10 0	57	70	30	13
Bhopal .. .. .	3 9	7 4	9 4	40	79	21	39
Bihar .. .. .	6 9	7 2	9 0	75	80	20	5
Hyderabad .. .. .	7 8	8 4	9 3	83	90	10	7
Kashmir .. .. .	3 10	6 6	8 9	44	74	26	30
East Punjab .. .. .	5 0	6 6	8 2	61	79	21	18
United Provinces .. .. .	4 0	4 10	8 0	50	60	40	10
Baroda .. .. .	4 0	5 6	7 0	57	79	21	22
Average .. .. .	5 3	6 9	8 11	59	76	24	17

As producers generally keep both types of animals and the quantity of milk may often be too small to market it separately most of the milk for fluid consumption, is marketed in mixed form. It is observed that the differences in margins for mixed milk are generally governed by the same factors as those mentioned in the case of cow and buffalo milks. In West Bengal, the share of the producer in all the three types of milk remains fixed at 64 per cent., but the retailers' margin is largest in the case of mixed milk and the lowest in case of cow milk. West Bengal

abounds in cow milk and most of the retailers handle cow milk. Buffalo or mixed milks are available in comparatively smaller quantities and the few retailers who deal in these charge a little more.

The foregoing table indicates that barring a few cases which may have their own special problems of production, assembling and distribution, the margins in the case of mixed milk are more equitably distributed than in the other two types. It being a composite product, this is but natural.

#### (5) PRICE SPREADS OF GOAT MILK.

It is observed that collectors who buy goat milk from village producers retail it themselves and there is practically no wholesale business in this type of milk. The available information is summarised in the following table and a diagrammatic illustration appears opposite page 73.

*Price spreads of goat milk.*

Area.				Pro- ducer's price per seer.	Retail- er's price per seer.	Percen- tage of retailer's price received by producers.	Percentage margin of retailers.
				As. P.	As. P.		
Cochin	..	..	..	10 2	15 3	67	33
Kashmir	..	..	..	12 2	14 10	82	18
Travancore	..	..	..	9 5	14 0	67	33
West Bengal	..	..	..	8 0	12 3	65	35
United Provinces	..	..	..	4 0	6 0	67	33
East Punjab	..	..	..	4 0	6 0	67	33
Patiala	..	..	..	4 0	5 0	80	20
Saurashtra	..	..	..	3 8	4 3	86	14
Baroda	..	..	..	1 4	2 4	57	43
Average				6 3	8 10	71	29

It is seen that the producers receive nearly two-thirds of the consumers' price and the retailers' margin is also fairly constant in most of the areas.

#### J.—Cost of milk production.

Very few studies have been made on the economics of different phases of Indian agriculture. An enquiry into the cost of milk production relating to animals kept in Government farms (mostly in the Punjab) was made in 1932-33, by the Animal Husbandary Bureau of the Indian Council of Agricultural Research. Supervision charges and

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interest charges on capital were not taken into account in these studies. The cost of production of milk and butter-fat worked out as under:—

Area.						Average lactational yield.	Cost per pound of milk.	Cost per pound of butter-fat.
						lb.	Pics.	As. P.
Sindhi cows	..	..	..	..	..	3,050	9.42	15 8.4
Ordinary Sahiwal cows	..	..	..	..	..	3,800	9.18	15 3.6
Ferozepore Sahiwal cows	..	..	..	..	..	6,000	7.16	12 11.6
Half-bred cows*	..	..	..	..	..	6,000	6.49	13 6.3
Murrah buffaloes	..	..	..	..	..	3,100	11.14	13 3.1

These records, although they cannot be applied to village cattle, nevertheless, show that (i) that the cost of production varies from breed, to breed (ii) the better the milking capacity of the cows the less is the cost of production of milk or butter-fat and (iii) specially bred and highly pedigreed Sahiwal cows beat a she-buffalo in production at a lesser cost per lb.

Data relating to the cost of production of milk in the Agricultural College Dairy, Coimbatore (1945-46) and Livestock Research Station, Hosur (1946-47 and 1947-48) may be seen in Appendix VIII. The average lactational yield per cow and the butter-fat content of the milk have not been indicated. But all charges debitable to milk production have been taken into consideration in working out the cost of production.

The cost of production of reconstituted milk at the Madras Government Milk Factory and that of toned milk at Bombay may be seen in Appendix IX.

Unfortunately no reliable data of any kind are available, showing cost of production of milk and milk products under (i) conditions obtaining in private stables in cities, (ii) in villages adjoining towns which send fluid milk for urban consumption and (iii) in remote villages with no demand for fluid milk. The general opinion is that milk produced in Government or military farms and private dairies is more costly than milk produced under village conditions. The arguments are somewhat like this: Milk production is only a sideline of the villagers who do not incur any extra expenditure on feed or for maintenance of the cattle. The animal shifts for herself; grazes on all and sundry and is only occasionally given a morsel of bran or concentrates by the villager. Whatever quantity of milk the starved animal yields is thus regarded as a net gain by the producer. It is, however, not realised that such

\*First crosses between imported bulls (Ayrshire, Friesian or Shorthorn) and indigenous cows.

cattle eat away through un-controlled grazing and otherwise much more than what they give back as first class proteins in the milk they yield and instead of being a source of income to the villager, they are actually causing enormous wastage of the national reserves.

In other countries, during recent years, drastic improvements in general standards of production have been effected, through the co-operation of economists, technologists and scientists. Several investigations have been made with the broad aim of producing "the maximum quantity of milk of the requisite quality from a particular herd at the least cost and with maximum profit".\* These investigations have taken the form of surveys of typical milk producing areas by skilled economists. Production costs have been analysed, inputs compared with outputs, income with expenditure and factors influencing profitability, yield per cow, per acre, per man-hour, per £100 spent, etc. are accurately determined. A detailed investigation of this nature will at once show which are the commercially inefficient herds.

The Milk Sub-committee and the Prices Sub-committee of the Policy Committee on Agriculture, Forestry and Fisheries, have noted the total absence of data on the cost of production, handling, etc. of milk and have recommended that early steps should be taken to institute such enquiries by giving adequate grants to Universities, Municipalities and other local bodies. In the "Five-year Milk Plan" of the Bombay Government, provision has been made for the appointment of an officer, specially trained in England, for working out periodically the cost of milk production and the cost of manufacture of products for the different areas of the Bombay Province.

The correct determination of the cost of milk production under different and representative conditions from cows, she-buffaloes and goats is of vital importance and should receive the attention of the Central and local Governments immediately. It is the only true index of the efficiency or otherwise of the cattle, their feeding and management, good or poor. It is also obvious that in any developmental scheme, the cost of milk production is of fundamental importance to safeguard the interests of producers and in securing them a reasonable profit. It also helps to detect items which bring about avoidable losses, so important from the national point of view.

#### **K.—Relative returns from sale of milk and products and suggestions for improving them.**

Throughout the world, the return on milk sold for fluid consumption is relatively more than when it is converted into and sold as products. During the five-year period ending 1937-38, producers in England who marketed their milk products through the "Milk Marketing Board" received only 36.0 per cent. of what they would have got had they sold

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\*Dairy Information by H. B. Cronshaw—p. 56.

the milk for fluid consumption. During the period stated above 30.5 per cent. of the total quantity of milk handled by the Marketing Board was used for manufacturing purposes. During 1944-45, due to Government control, only 11 per cent. of the production was diverted for manufacturing purposes. In the Indian Union, the position is different. Here 53 per cent. of the production is converted into products by the producers themselves. The relative returns of the producers obtained from milk and from products made at the holdings are given in the table below :—

*Relative returns from sale of milk and that of products  
received ex-holdings.*

(Data relate to 1945).

Product.	Proportion of milk utilised for the product.	Average price per seer.	Quantity of milk required to make a seer of product.	Price realised per seer of milk.	Percentage of price received for product compared with fluid milk.
	(Percentage to total).	Rs. A. P.	Seers.	Rs. A. P.	
Milk sold for fluid consumption	..	0 4 9	..	0 4 9	(100)
Ghee .. .. .	43.3	2 15 0	17	0 2 9	58
Khoa .. .. .	4.1	1 0 0	4	0 4 0	84
Country butter .. .. .	5.7	2 7 0	13	0 3 0	63

The prices shown in the table although calculated using prices in some producing areas of the United Provinces are generally applicable to the whole of the Indian Union. The expenditure incurred by the producer in the preparation of the products has not been taken into consideration.

It will be observed that, next to fluid milk, *khoa* gives the highest return, while the lowest are obtained from *ghee* which accounts for 43 per cent. of the production. Country butter gives slightly better returns than *ghee*.

About 9.4 per cent. of the production is sold to the *halwais* and others for preparing *Dahi*, *rabri*, *Malai* and ice-cream. Milk for these are sold at the same wholesale rates as milk for fluid consumption. These products are made by the *halwais* in the urban areas for local consumption.

The *halwais* generally are able to get a net gain of 25 to 40 per cent. more on *dahi*, *rabri*, and *malai* than on raw milk. The profits on ice-cream are probably more.

The above discussion shows that the products made at the producer's holdings which cover about 54 per cent. of the total production fetch him a smaller return than when he is able to sell the milk for fluid consumption. The *halwais*, on the other hand, are able to make more from the sale of products than from fluid milk. They, however, do not share the extra profits with the producers.

#### **L.—A price policy for milk and other dairy products.**

The special aspects of the dairy industry which have to be taken into consideration while formulating a price policy for dairy products in the Indian Union are :—

- (a) their production needs to be expanded considerably to meet the nutritional demands of the population;
- (b) they are perishable and the lack of suitable facilities for transport result in the localisation of the markets and in wide variations in prices in different areas; there is no such thing as an integrated all-India price or even an all-province price;
- (c) there is a wide disparity between the prices received by the producer and the prices paid by the consumer; and
- (d) prices at which the products can be made available to the consumer are normally beyond their means.

The price policy must assure a price which will provide an incentive to the producer to increase his production. By providing necessary and modern facilities for processing, transport and distribution, cutting unnecessary items of expenditure, etc., the products should be made cheaper to the consumer. If certain classes of consumers still find the price beyond their means, supplies should be made available to them on a subsidised basis. The implementation of these principles will call for improvement in the organization of the production and marketing of these products.

The parity approach which may be suitable for fixation of prices of food and commercial crops cannot be applied for dairy products as markets are extremely localised. Nor can the technique of buffer stocks and marginal purchase and sale operations be employed for enforcement of the prices owing to the extreme perishability of the products.

For fixing prices and for deciding the general policy applicable to dairy products in any region the Prices Sub-committee of the Policy Committee on Agriculture, Forestry and Fisheries has recommended the setting up of regional Milk Commissions consisting of representatives of producers, processors, traders and consumers which should function under the general direction of the State. These Commissions should concern themselves both with the problem of increasing production and with the problem of improving marketing and distribution through the establishment of cold storages, processing plants and refrigerated transport. The State may subsidise particular classes of consumers, if it considers necessary, by requiring such organizations to release supplies to them at concessional rates, reimbursing them itself thereafter. The organizations should have attached to themselves impartial price fixing

boards which should take into account all interests concerned and determine fair prices.

**M.—Prices of dried and condensed milk and milk-foods  
for infants and invalids.**

These are imported products and are not manufactured in India. Their import prices, excluding duty, have already been given in Chapter I. Skimmed milk powder, containing not more than 4 per cent. fat, or added ingredients, have been exempted from payment of customs duty since 1939.

**CHAPTER IV.—COLLECTION, TREATMENT AND DISTRIBUTION.**

**A.—General background.**

Production of milk is mainly a rural industry but the saleable demand for fluid consumption is mostly concentrated in urban areas. The villages are generally self-sufficient. The cultivators whose principal occupation is agriculture keep an animal or two, partly to meet their domestic requirements of milk and partly to supplement their income from the sale of ghee. Those who do not own cattle get milk directly from their neighbours. Thus, although 90 per cent of the Indian population live in the villages, there is practically no assembling of milk for sale in rural areas. Similarly, the quantities required in rural areas need no treatment.

The demand for fluid milk, though concentrated in towns and cities, is nonetheless large compared with the total production of milk in India. Figures of fluid consumption in a number of towns and cities in different parts of the country show that on an average 1 maund of milk per head per annum is consumed by the urban population. On this basis, the entire urban population, comprising 441 lakh persons in the Indian Union, consumes annually an equal number of maunds of milk. In addition, about 400 lakh maunds are made into products, *e.g.*, *cond.*, *ice-cream*, *rabri*, *malai*, etc., in urban areas and about 59 lakh maunds are used in the preparation of cream and creamery butter. In all, therefore, 900 lakh maunds or 18.7 per cent of the total milk production in the Indian Union enter the fluid milk trade of the country. At Rs. 15 per maund, its value comes to Rs. 135 crores per annum. This, in short, is the quantity which constitutes the real market supply. Future discussions regarding assembling, distribution and treatment will be confined to this quantity unless otherwise stated.

It will be seen later in this chapter that roughly 60 to 70 per cent. of the urban supplies are produced within the towns and cities and only the remainder is derived from the rural areas. The production in the countryside takes place in innumerable village holdings on a fragmentary scale. Persons who live in villages near towns specialise in milk production but only a few have large herds of cattle. On an average, a village holding in India has 2 to 4 cows and she-buffaloes against 9 cows in Denmark, 12 in the United States of America and 25 in Great Britain and New Zealand. Compared with those countries, the daily yield of Indian milch cattle is poor and consequently, the daily production of

milk per holding is further reduced. The collection of small quantities from a large number of scattered producers is, therefore, the first problem.

The problems of distribution are somewhat similar. The quantities which are sold at a time vary considerably and depend upon the customer. Very few people in India purchase milk in lots of seer or more, and the majority purchase about  $\frac{1}{2}$  to  $\frac{1}{2}$  seer at a time. This puts certain difficulties in the way of organised distribution.

(1) PRODUCTION OF MILK PER VILLAGE AND PER SQUARE MILE  
IN THE INDIAN UNION.

The quantities of milk produced per day in a village and per square mile in the different areas in the Indian Union, worked out on the basis of the number of villages and the total area, are given in the table below:

*Daily production of milk per village and per square mile*

Name of units.	Area in square miles.	Number of villages (1941)	Annual production of milk.	Milk produced per day	
				Per village.	Per sq. mile.
	(Thou- sands)	(Thous- sands)	(Lakh mds.)	Md. Sr.	Md. Sr.
<b>Provinces :</b>					
Assam .. .. .	49.5	25.3	26.48	0 12	0 6
Bihar .. .. .	70.3	68.9	442.91	1 30	1 29
Bombay .. .. .	103.4	27.4	211.44	2 5	0 22
C. P. & Berar .. .. .	130.2	44.9	108.93	0 27	0 9
Delhi .. .. .	0.6	0.3	14.08	12 26	6 29
East Punjab .. .. .	37.5	16.2	598.33	10 4	4 15
Madras .. .. .	127.8	35.9	576.90	4 16	1 10
Orissa .. .. .	55.8	40.6	92.77	0 25	0 18
United Provinces .. .. .	112.5	104.6	1,119.26	2 37	2 29
West Bengal .. .. .	28.4	34.3	165.26	1 13	1 24
<b>Unions &amp; States :</b>					
Baroda .. .. .	8.2	2.9	107.42	10 6	3 24
Hyderabad .. .. .	82.3	22.4	164.91	2 1	0 22
Kashmir .. .. .	82.3	8.7	50.56	1 23	0 7
Madhya Bharat .. .. .	46.8	19.7	143.58	2 0	0 35
Matsya .. .. .	7.5	4.0	56.12	3 34	2 2
Mysore .. .. .	29.5	16.4	88.03	1 19	0 3
Patiala East Punjab States Union	10.1	6.2	131.65	5 33	3 23
Rajasthan .. .. .	29.6	13.4	183.89	3 31	1 23
Saurashtra .. .. .	31.9	6.9	183.28	7 12	1 22
Travancore .. .. .	7.7	3.9	22.51	1 23	0 32
Vindhya Pradesh .. .. .	24.7	11.3	33.22	5 32	0 15
<b>Other Provinces &amp; States</b> .. .. .	144.3	38.7	293.97	2 3	0 22
<b>Total</b> .. .. .	1,220.9	552.9	4,815.50	2 15	1 3



The figures help to show the problem in its true perspective. The average gross production per village is less than 2½ maunds per day. The density is even less, being only 1 md. 4 srs. per square mile. This, when considered along with the fact that major portion of the milk produced is utilised in the manufacture of products and some is retained for the domestic use of producers, clearly shows that the quantity of milk available in the villages for sale is so small that even for assembling, say, 50 maunds milk per day (in two lots, twice a day, morning and evening) several villages have to be visited, considerable distances traversed and a large number of producers dealt with.

(2) PRODUCTION OF MILK IN SOME OF THE DAIRYING DISTRICTS.

In the foregoing table, the figures of production have been worked on a regional basis. Being large units they do not give a correct idea of the conditions prevailing in the important dairying districts. Figures for some of the districts where the production is most concentrated and in Denmark\* are given in the following table:

*Intensity of production of milk in some of the districts of Indian Union and in Denmark.*

District.	Area in square miles.	Per square mile			
		No. of milch animals.	Production of milk per day.		Human population. (1941)
			Md.	Sr.	
Coimbatore (Madras) .. ..	7,121	61	1	9	395
Amritsar (East Punjab) ..	1,572	124	7	31	899
Aligarh (United Provinces) ..	1,940	120	3	29	708
Meerut (Do.) .. ..	2,323	120	3	29	816
Kaira (Bombay) .. ..	1,617	96	1	23	566
Gaya (Bihar) .. ..	4,766	70	2	26	582
Baroda .. ..	8,176	84	3	0	349
All-India average .. ..	12,20,900	50	1	3	253
Denmark .. ..	16,575	99	23	9	232

Of all the districts, the production of milk is most intense in Amritsar district, but the intensity there is only about one-third of the quantity per square mile compared with Denmark. It is also very thickly populated with about 900 persons per square mile compared with 232 in Denmark.

\*For 1939 from "Dairy Information" by H. B. Cronshaw.

### (3) PRODUCTION OF MILK WITHIN CITIES AND IN VILLAGES SURROUNDING THEM.

Although the production of milk in the Indian Union as a whole is scattered, it is somewhat concentrated near the towns and cities. In fact, it is only in the towns and in villages adjoining them that one finds professional milk-men whose sole job is production of milk. Enquiries at several cities and large towns have revealed that 60 to 70 per cent. of the fluid milk requirements of a place are produced within the municipal limits and only the remaining 30 to 40 per cent. derived from the villages situated at a distance of 4 to 15 miles. In these villages, there are usually producers who maintain large herds of cattle and the production is concentrated.

It will be seen in the chapter on "Transportation" that long distance transport of milk is generally absent and that the producers and collectors prefer to use those means on which they have to spend very little cash, e.g., head transport, bicycles, pack animals, etc. These means are slow and can cover only 4 to 6 miles an hour. Since milk has to be carried to the place of consumption as quickly as possible, it is obvious that most of the milk obtained from outside is from villages situated 5 to 10 miles away from them.

#### B.—Agencies engaged in the collection and distribution of milk and their functions.

##### (1) GENERAL.

The perishable nature of milk and the warm climate of the country make it obligatory to collect and distribute milk within a few hours of its leaving the udder. Besides the large number of producers, estimated to be about 193 lakhs in rural and 2 lakhs in urban areas, several groups of persons are engaged in its assembling, handling and distribution. Considering the average quantity handled per day by collectors, *kachais*, dairies, etc., and the number of employees that some of them keep, it is estimated that for every maund of milk about two men are engaged for rendering the above services. On this basis, for handling about 900 lakh maunds of milk per annum, approximately five lakh persons are employed to render the various services between producers and consumers.

The functionaries deal in small groups consisting of a few producers, a collector and a wholesaler or retailer. An individual group works mostly on a contract basis, bound not in writing but operates on mutual trust and understanding. Often the group may be together for many years without a change. The size of a group as well as its functions may, however, vary in different localities. In some cases, a quantity of milk may change ownership three or four times, while in others, one person may perform the functions of several groups and deliver the milk direct to consumers. There is also no strict division between the wholesale and retail trade and a wholesaler may also be a retailer and *vice versa*.

The following table gives the important groups of persons engaged in the fluid milk trade, together with their general functions. The diagram

opposite page 103 illustrates the common channels of assembling and distribution of milk for meeting the urban demand:

*Functionaries engaged in the assembling, treatment and distribution of fluid milk.*

Main group.	Sub-group.	General functions.
1. Producers ..	(i) Rural producers.	To sell raw milk <i>ex-holding</i> to rural consumers and to collectors.
	(ii) Urban producers.	To sell raw milk <i>ex-stables</i> to urban wholesalers and to consumers. To distribute milk by taking milch cattle to consumers' residences.
	(iii) Dairy farms	To deliver milk to consumers and institutions, raw or processed.
2. Wholesalers	(iv) Collectors ..	To collect milk from village producers or other collectors and deliver it in wholesale to retailers or in retail to consumers.
	(v) Co-operative societies.	To collect milk from members and deliver it wholesale to unions for sale as raw or processed. To deliver raw milk direct to consumers.
3. Retailers ..	(vi) Halwais (vii) Milk vendors }	To receive milk from collectors, milk markets or direct from producers and sell it, generally <i>ex-shop</i> , as raw, boiled, sweetened or unsweetened.
	(viii) Dairies ..	
	(ix) Producer-retailers.	To deliver home-produced milk direct to consumers or sell it through a milk market. To sell milk by hawking it.

It is seen that between producers and consumers there are generally six agencies. Their functions are described separately below:

(2) RURAL PRODUCERS.

The number of producers of milk is not available in the census returns. It is estimated on the basis of cows and she-buffaloes per holding which has been ascertained in a few economic enquiries in the past. It is observed that an average holding has only three adult cows and she-buffaloes (dry or in milk) excluding other stock. Considering that there are about 395 lakh cows and 184 lakh she-buffaloes or a total of 579 lakh milch animals in the rural areas of the Indian Union, the number of village producers of milk is estimated to be about 193 lakhs. These producers are also cultivators, either as owners or as tenants. They breed cattle on a small scale. It is obvious that, due to the limited size of milch stock, some producers may cease to produce milk when all the animals are dry.

## (3) URBAN PRODUCERS.

Due to heavier overhead charges, the urban producers keep larger herds than their rural co-professionals. Excluding the number of animals maintained by consumers for their domestic use, approximately 12.3 lakh cows and 8.7 lakh she-buffaloes comprise the milch stock of the urban producers. On the basis of, say, 10 animals per producer, there are about 2 lakh producers of milk in urban areas.

It is also noticed that the urban producers maintain more regularly the strength of their milch stock. They replace the dry animals with freshly calved ones from breeding areas. In fact, the entire demand of freshly calved cattle in the breeding tracts is from the urban producers of milk. For this, suitable milch stock is often indented from distant places. The professional milk-men in Bombay, Poona and Calcutta get cattle from East Punjab, a distance of about 800 miles. The Madras milkmen also at times get she-buffaloes from East Punjab, a distance of about 1,500 miles.

## (4) DAIRY FARMS.

If the definition of a dairy farm is taken to be a holding with land, suitable buildings, a dairy and a herd of, say, 75 cattle in milk, it is observed that there are about 70 such farms in the whole of the Indian Union. Of these, only about a dozen are privately owned; the remainder are Government farms, belonging to military or civil departments. The number of establishments which grow their own fodder and have an independent arrangement for the disposal of farm produced milk is, therefore, very small compared with the size of the country. The main reason for this has been the fact that dairy-farming has been an unremunerative enterprise in the past. High capital cost and heavy overhead charges cannot be covered by the sale price of milk which has to be more or less at par with that produced by petty *gawalas*, keeping one or two animals, which they maintain on purchased fodder and with risks and overhead charges comparatively small. If the accounts of the Government and private farms are carefully scrutinised and if all the items of expenditure are taken into account, it would be observed that many are run at a loss. They have, however, to be continued for one reason or other, which cannot be measured in terms of money.

The military dairy farms, which numbered about 100 (including branch farm, dairy issue and milk purchasing depots), during the War period ranked amongst the largest farms in the country. The total strength of herd at all military farms in undivided India\* rose from 12,869 heads on the 31st March 1940 to 65,637 on the 31st March 1945. Some of the farms had as many as 1,000 cattle. Since cessation of the hostilities and the partitioning of the country the number of such farms has now come down to 25 which are of a permanent nature. These farms are primarily maintained for providing troops and Military Hospitals with regular, wholesome and adequate supplies of milk, butter and cream.

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\*The strength in all farms in the Indian Union, at present, is 15,294.

The farms under civil departments are de-commercialised because some of them are teaching institutions, while others may be used as "feed-farms" for production of pedigree bulls for distribution in villages. The farms in some of the acceding States are established for palace requirements or for stud purposes and are not necessarily expected to make any profit.

At Bombay and Calcutta large herds up to 100 milch cattle may be kept by one party, but such instances are very few. They do not have any arable land to grow fodder, nor do they possess any dairy. The stock is maintained on purchased feeds and the milk is sold to wholesalers and others. They cannot, therefore, be styled as dairy farms but are classed as milch-cattle stables, belonging to urban producers.

Besides dairy farms, there are about 3,000 *pinjrapoles* and *gowshalas* in India. Some of these have a section which is run as a dairy farm and sells milk. Their main object, however, is to act as "homes" and "asylums" for disabled and destitute animals and often they have to purchase milk from others for feeding young calves and kids. These institutions, on the whole, cannot therefore, be classified as dairy farms.

The Milk Sub-committee of the Policy Committee on Agriculture, Forestry & Fisheries was of the opinion that these *gowshalas* form potential sources of supply of large quantities of milk as well as bulls for distribution in the milk producing areas and recommended the reorganization of the *gowshalas* with a view to locating them in natural surroundings in rural areas where they will engage themselves primarily in selective breeding of good milch stock with the assistance of veterinary departments and keep dry stock salvaged from city stables till they calve again.

#### (5) COLLECTORS.

Between the producer on the one hand and the retailer and the consumer on the other, the collector plays the most important part in the assembling of milk. It is he who visits the petty producers in the badly connected distant villages and, if the latter have insufficient quantities of milk, induces them to keep additional cattle by giving them loans. Similarly, it is the collector who endeavours to find a market for the village milk by meeting the needs of cream or butter manufacturers, retailers, *halwais*, institutions and consumers. Any irregularity in the performance of his twice-a-day duty immediately paralyses the milk supply handled by him.

Collectors generally assemble the village milk by three methods; on foot (by carrying pots of milk as headload or suspending them over shoulder slings), on bicycles and by horse-drawn *tongas*. Small boats may also be used if the villages are situated on the bank of a river or if an area is inundated during monsoon. This practice is, however, confined to parts of the United Provinces, Assam and West Bengal. In some areas pack donkeys or ponies may also be used for transport.

Details of the above are further dealt with in a subsequent chapter, but here it may be stated that the above-mentioned methods limit the quantity of milk that could be handled per day by a collector and a large number of men are perforce required for assembling the milk. At

Delhi, roughly 1,000 cycle collectors, 250 collectors on foot and 50 *tongas* or about 1,300 persons in all are engaged in assembling 5,000 maunds of milk per day which amounts to nearly 2 maunds of milk handled per man per day. At Ahmedabad and in many towns in Western India a very large proportion of milk is assembled by women who bring it as head-loads from the surrounding villages, each carrying about 20 seers of milk per trip, or a maund per day.

#### (6) CO-OPERATIVE SOCIETIES AND MILK UNIONS.

At present there are 94 producers' societies and 28 milk unions. Some of the societies are not affiliated to any of the unions and deal directly with consumers. This subject is discussed fully in a subsequent chapter of this report.

#### (7) *Halwais*.

The word *halwai* (probably from *halwa*, a kind of sweetmeat) means a manufacturer and seller of sweetmeat. While some of the sweetmeat dealers may sell milk, all milk selling *halwais* do not deal in sweetmeats. The chief characteristic of a *halwai's* shop is that it has a hearth for boiling milk or for making *khoa*.

As a group they are very important for retailing the milk, mostly *ex-shop* although at times they may arrange to deliver raw milk at the residence of the consumers. They keep the shops open practically throughout the day and late in the night and sell raw or boiled milk, curd, *khoa*, etc. This type of shop is common throughout the country but is more popular in the North than in the South. An average *halwai* handles about 2 to 3 maunds of milk per day.

#### (8) MILK VENDORS.

The milk vendors have small shops at which they generally deal in raw milk. They may boil the milk for preparing curd if they deal in this product also. As they deal mainly in raw milk the shops are kept open only for 2 to 3 hours in the morning and evening when the village milk is received and is distributed generally *ex-shop*. These shops are more popular in the South than in the North.

#### (9) DAIRIES.

Dairies always handle purchased milk and are found only in large cities, cantonments and hill stations. They generally cater for the needs of the upper middle classes. Fresh milk (raw or processed), cream and butter only are handled. Some dairies have modern plants for pasteurisation.

The number of dairies on the whole is not large, but it is on the increase. An average dairy handles daily about 8 to 10 maunds of milk, but one or two dairies at Bombay handle as much as 100 maunds of processed milk per day.

#### (10) PRODUCER-RETAILERS.

In large cities the number of producers selling milk to consumers is not great, but in smaller towns, and particularly in the South, the practice is more common. In a way, this form of distribution shows the

undeveloped condition of milk marketing because the producer himself has to spend a considerable part of his time in retailing the milk.

In western India, the producers send their women folk with head-loads of milk to the town. They generally assemble at some convenient place, which ultimately functions as a "milk market". The quantity of milk which remains unsold, say, by about 10 in the morning and 7 in the evening is hawked about or may be delivered to the *halwais* at a cheaper rate. This is, perhaps, the only instance of hawking milk, *i.e.* the seller calls out that the milk is for sale; otherwise, hawking is not prevalent in the milk trade to any appreciable extent.

### C.—Milk Markets.

The uncontracted supplies of milk are generally sold by open auction at places called milk markets. In a town or city where some milk is brought by rail, the station platform itself or the vicinity of the railway station is used as the market place.

#### (1) WHOLESALE MARKETS.

The cities of Bombay, Calcutta and Ahmedabad and the small towns in Gujrat, Saurashtra, Bihar, the Central Provinces and Berar and West Bengal, have one or more wholesale milk markets where milk from nearby villages is assembled and sold. The consumers, *halwais* and some of the cream merchants make their purchases in these markets. Generally, more milk is received in the mornings than in the evenings. These markets belong invariably to private persons and are governed more by conventions than by rules or regulations. Very often an open space is used for the purpose and no charge is levied.

Calcutta has three important private milk markets located at Bowbazar, Sealdah and Chitpur Road. The Bombay milk market is owned by a body of five persons who are its trustees. The milk may be sold direct to the buyers or through a *dalal*. There are about 10 to 12 *dalals* in this market and about 200 containers are disposed of daily. Milk suspected for its quality is tested by making *khoa*. The yield of *khoa* should be 1/5th of the weight of milk. A major part of the income from this market is utilised for running a school for the poorer classes and a part is earmarked for the *Wakf* fund. When most of the milk has been disposed of, the trustees after due enquiry announce the average selling price of milk for that day. This governs the price of all uncontracted milk delivered on that day by the city producers. At Nadiad (Bombay Province) also there is a *pol* (narrow street) where the collectors and producers assemble to sell the milk, but if the milk of any one of them is proved to be adulterated, he is fined Rs. 51 by the *panchayat*. At the Jageswari Market, Poona. 25 to 30 maunds of milk are sold every day.

#### (2) RETAIL MARKETS.

At some cities, *e.g.*, Calcutta and Simla, some stalls have been set apart in Municipal Markets for sale of milk. These are styled by the stall-holders as "dairies" and are given fancy names. Raw milk is

handled in these stalls and some of them may have a domestic refrigerator for keeping the cans of milk cool. The location of milk shops at one place enables the health authorities to inspect them more easily and regularly.

### (3) POSSIBILITIES OF ESTABLISHING BIG COLLECTION CENTRES FOR MILK.

For all unperishable commodities or even for a perishable one like eggs, there exists important assembling centres in areas of concentrated production, but for fluid milk there are no such places. This is due to the extreme perishability of milk and its complicated and expensive transport which entails usage of comparatively costly and returnable containers. These must be thoroughly cleaned each time they are used. The producers or dealers cannot, therefore, be expected to bring or send milk in large quantities to a centre for sale unless they are assured of a ready and regular market. Similarly, stocks are difficult to keep even for meeting temporary rushes that may occur during festivals and fairs.

The Milk Sub-committee of the Policy Committee on Agriculture, Forestry & Fisheries has considered this question and recommended action of two kinds: Firstly, for meeting the deficiency of milk in towns, it has suggested that a suitable organization, preferably on co-operative lines, should be set up in suitable areas that are at a distance of more than 20 miles from towns, for assembling and transporting it raw (in lorries) to a central processing plant, for cold storage, pasteurisation and distribution of the milk from the central dairy. This will to some extent, enable developing potential dairy areas in the vicinity of towns and cities. There are, however, areas in almost all provinces where large quantities of milk surplus to the requirements of the local population are being produced at present. For developing these milk "pockets", the Sub-committee recommended that "creameries" be established for collection and processing of the milk in the producing areas and arrangements made for the long distance transport of the processed milk to consuming centres and for its storage and distribution according to demand at such centres.

Producers' Co-operative Societies and Milk Unions for collection and transport of milk from suburban areas and "creameries" for assembling and processing milk in the distant "milk pockets" are being organized in all suitable places. The subject is dealt with in detail in Chapter VII of this report.

### D.—Handling and treatment of milk.

In the sense in which it is understood in Western countries, very little handling, treatment or processing of milk is done in India. This is mainly because the bulk of it is produced and consumed in villages where very little handling and practically no treatment are required. In the cities, too, it is either produced within their boundaries or in the surrounding villages from where it is delivered to the consumers in a raw state within a few hours of its production. The consumers have the universal habit of boiling the milk before use. Contrary to this, in the Western countries milk is often 3 to 4 days old before it reaches



the city consumers and has often to travel some hundreds of miles. This involves adequate processing, storage and transportation under controlled temperatures, both for purposes of public health and for prolonging its life. Production and marketing of milk under different grades, as "Grade A", "T.T." (Tuberculin Tested), etc., which are absent in this country, also necessitate specialised handling and treatment.

Practices prevalent in India in this respect are described below :—

#### (1) MILKING.

The animals are universally hand-milked, and machine-milking is almost unknown. A few of the farms are equipped with milking machines but they are seldom used with any degree of regularity. Cheapness of labour, and difficulties of cleaning and keeping the machine in a hygienic condition in tropical climate appear to be the main reasons for giving up their use even by the few farms who own them. The other important reason is that in India the calf has to be brought to the cow or she-buffaloes at each milking to suckle some milk. This makes the usage of machines difficult and useless, if not impossible.

#### (2) MIXING OF DIFFERENT TYPES OF MILK.

Cows, buffaloes and goats are milked individually and the producers obtain the milk from each one of them separately. After retaining a quantity for domestic use from one or two types of milk the rest is marketed. In some cases, either due to price differences or practical difficulties in marketing small lots separately, producers are inclined to mix all the milk obtained at their holdings before sale. As the collectors of milk are invariably aware of the type and number of animals each producer possesses, they may insist on receiving the milk from different animals separately and if necessary, may do the mixing themselves. Some of the collectors may not accept a particular type of milk and in such cases also the producers have to market the milk unmixed.

#### (3) SUPERVISION AND TESTING FOR QUALITY.

In the early stages of assembling there is only one method of ensuring the purity of milk. The collectors often personally supervise the milking of the producers' cattle and may even milk some of the animals themselves. With some of the co-operative societies also this is the only way of maintaining control over the quality of members' milk. Since milk can be adulterated with water without being detected by the naked eye, the defects of the system, which is by no means fool-proof, and the necessity of having proper fat tests for individual members are discussed in a later chapter. In certain cases the collectors may insist upon the producers feeding the animals adequately to improve the quality of milk. Many collectors live in the villages and present themselves at feeding and milking times to see that the above conditions are fulfilled.

With a view to checking the quality of milk, the collectors, *halwais* and others adopt a rather slow and cumbersome method of preparing *khoo* from a part of the milk and note its outturn\*. The test itself has its defects but throughout the fluid milk trade, considerable reliance is placed on it. It is, however, not performed as a matter of routine but only as a surprise check.

The dairies have cream separators and they use these to test the quality of village milk. 10 lb. of milk is expected to produce 1 lb. of cream of a thickness which would yield 12 oz. of butter or 10 oz. of ghee. This is roughly based on a 6 per cent fat content in milk.

On most of the Government farms and a few private farms, the Gerber fat test is performed as a matter of routine. Of late, the use of cheap glass lacto-meters by some of the *halwais* is also becoming common but they are reckoned unreliable owing to certain practices, e.g., adding of skimmed milk, etc.

#### (4) BOILING.

Boiling the milk before drinking is a universal practice and the custom is so well established that there is a distinct prejudice against drinking raw milk. It is observed that even pasteurised milk is boiled before it is consumed in most of the Indian homes. Chilling the milk cheaply, e.g., with water is impracticable in this country during most parts of the year. Heating the milk and keeping it at an elevated temperature is better suited to the warm climate. Besides, it is a comparatively cheaper method of prolonging the saleable life of milk. It is observed that milk keeps at about 150°F. for a longer time than at ordinary day temperature or say 80°F. to 100°F.

All *halwais* deal in boiled milk. After boiling it once, the milk is kept at about 175°F and is drunk when it is at about 110°F. Boiled milk is seldom delivered at consumers' houses and is generally meant for consumption at the shop. A few people may take it to their residence also. Boiled milk is made available to the travellers at many railway stations by licensed vendors and hawkers.

In parts of Bombay province, both rural and urban, it is customary to boil the milk, and allow it to remain on the fire for several hours. The layer of cream which rises to the surface is skimmed and sold separately and the milk which has been considerably reduced in fat content is sold as boiled milk.

#### (5) PASTEURISATION.

Pasteurisation is the raising of temperature of clean milk for a certain time under suitable conditions in order to destroy undesirable pathogenic and other organisms. Thereafter it is rapidly cooled to a temperature at which the growth of the latter is retarded. In order to prevent re-contamination of pasteurised milk, it is filled and sealed in sterilised bottles which are maintained at a suitable low temperature till the milk is

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\*The method of carrying out this test is described in the Chapter on "Quality of market milk".

consumed. The process, apart from rendering the milk safer, prolongs its salable life compared with raw milk.

In the Western countries where the cities are much larger and *per capita* consumption compared with India high, pasteurisation has to be necessarily adopted in order to assemble in bulk large supplies from distant areas. Milk in some of the Western cities is obtained from a distance of 500 to 600 miles and by the time it is processed and distributed to the consumers it is 2 to 3 days old. Further, in order to prevent or minimise the danger of communicable diseases, from cattle to human beings, especially tuberculosis, it is essential to give milk an adequate treatment. There has, however, been no compulsion to use the process and the credit for its voluntary adoption goes to the trade as well as to the encouragement given by the Public Health Authorities. The result has been that in the United Kingdom 70 to 80 per cent. of the milk supply of several towns is pasteurised. In London, the figure is probably over 90 per cent. In Stockholm about 97 per cent. of the supply is pasteurised. On the other hand, in agricultural countries like Switzerland, pasteurisation is uncommon and even in Geneva the proportion of pasteurised milk is less than 1 per cent. of the total sales.\*

In India, pasteurisation is confined to a few farms and dairies. The army department has been the pioneer in establishing large dairy farms in India for supply of milk to the troops. It was also the first in introducing pasteurisation and adopting it for treating milk produced by its dairy farms. Apart from Government farms, there are at present not more than a dozen private concerns in the whole country which pasteurise their milk.

There are several reasons why pasteurisation has not been able to establish itself more extensively. Firstly, the process needs an expensive plant and equipment, suitable buildings and skilled management. These requirements add considerably to the price of processed milk and consequently, restrict its sales to only a small proportion of consumers. Secondly, for a plant to be an economic unit, it should handle 5,000 to 10,000 lb.† of milk per day depending upon local conditions. To enable this to be done satisfactorily and economically the dairyman must have a wide choice in obtaining reasonably priced raw milk from conveniently placed collecting centres. This is possible only in areas where production is concentrated. Areas of scattered production are useless for the purpose as they would add considerably to the cost of collection and also increase the risk of spoilage of raw milk in transit. But in rural areas of plentiful supplies it is obvious that there would be no local demand for pasteurised milk and the market for it would have to be sought in distant urban centres. For this, suitable transport facilities under cold conditions must be available, particularly in a warm country like India. Unfortunately, they are absent on most of the railways. Further, it should be understood that pasteurisation cannot make bad milk

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\*League of Nations, publications.

†In other countries, plants handling 10 to 15 times these quantities are quite common.

good, or improve dirty or acid milk, which has not been collected rapidly enough. It can only make tolerably clean milk safe and prolong its life under suitable conditions of storage. Milk produced in villages by numerous producers may contain types of micro-organisms which are not destroyed by the usual pasteurising temperatures or which may actually multiply during the process. The quality of raw milk is, therefore, of great importance and unless production is adequately supervised, which further adds to the cost, pasteurisation cannot be successfully or safely practised.

Mention may be made here of the new method of processing adopted by the military dairy farms some years ago. All milk is heated to 145°F for 30 minutes. The usual procedure in farms which have a refrigerating plant is to cool the milk to 40°F for sending to camps or hill depots and to 50°F for local sales. At farms where refrigerating plants are not available, the milk is cooled to 60°—65°F in cold weather through use of ordinary water. But in summer the procedure is to issue the milk hot as discharged from the heater. Experience has shown that milk issued hot had a lower bacterial content on delivery to customers than milk cooled by water and issued warm. This procedure of issuing milk hot as discharged from the heater is followed in about 27 farms and the quantity of milk thus processed is approximately 1,580 maunds per day.

Transport and distribution of "hot" milk is probably more in keeping with the dietary habits of the people of this country and can be carried out at a cheaper cost than pasteurisation and distribution of the chilled milk.

Pasteurised milk, unless it is sold in sealed containers or bottles, renders itself open to the risk of recontamination and as such requires to be boiled before use to ensure safety. In some cities, "pasteurised" milk is retailed into consumer's vessels from sealed cans of half to one maund capacity. The milk is likely to get re-contaminated during this process. "Pasteurisation", in these circumstances, has been of value only as a means for increasing the marketable life of milk under tropical conditions and is therefore to be looked upon as a necessary commercial practice.

#### (6) STANDARDISATION OF MILK.

The legal standard for fat content in buffalo milk is 5 per cent. in most provinces. The natural fat content in buffalo milk is, however, often as high as 7 or 8 per cent. Some of the dairies, therefore, standardise the fat content before sale and reduce it to 5 per cent. This is done by skimming a part of the milk and by mixing the skimmed milk to the remaining whole milk. Thus a certain quantity of cream is obtained for selling as such or for making butter. The practice of standardising buffalo milk and putting on the market "toned milk" should be looked upon as a desirable one for many reasons, provided it is done by Government (as in "Bombay Milk Scheme") or a licensed agency on a monopoly basis. The Milk Sub-committee considered this question but rejected it as not feasible due to (a) the difficulty of obtaining a

dependable quantity and quality of separated milk with which toning can be done, (b) the small quantities of milk handled by each individual producer, and (c) the inadequacy of suitable staff to give effect to such a measure.

### **E.—Premises and equipment.**

Depending upon the circumstances, the best and latest as well as the worst and most undesirable types of premises and equipment are in use in the milk business. In some directions there have been no improvements at all and old methods, equipment and arrangements are adhered to in a most orthodox manner. On the other hand, most of the Government farms and dairies and some of the private farms have modern buildings and equipment and facilities for maintaining them in hygienic condition. It may be mentioned that dairy machinery and equipment are largely imported. The Milk Sub-committee was of the opinion that equipment available to the trade for bringing milk from rural areas to consuming centres is most inadequate and recommended (i) the indigenous manufacture of equipment and utensils of approved type by local firms and under Government aegis, if necessary on a subsidised basis; the Government should procure and supply essential materials at controlled rates to these firms and (ii) such machinery that cannot be manufactured in India, should be permitted for import under a high priority.

#### **(1) RURAL AND URBAN PRODUCERS.**

The milk producers and cattle breeders of the Indian Union collectively possess over a fourth of world's cattle but except in rare instances, premises such as properly constructed and well drained cattle-sheds, calf and calving pens, milk collecting rooms, etc., are absent. Many cattle have no standings at all and remain outdoors throughout the year except in very inclement weather. Very rarely are they tied even at milking time. In the villages they remain out for grazing even at nights and are driven home only for milking.

A few earthen and metal pots of odd sizes and shapes common to the locality and some galvanised iron buckets are all that the producers possess for milking the cattle. They do not use proper milk measures or weighing scales and have only a rough idea about the capacity of their vessels.

#### **(2) COLLECTORS.**

Earthen and brass pots up to about 20 seers capacity are used by collectors but those who make use of cycles have specially made bottle-shaped galvanised iron cans of various sizes. Some use second-hand kerosene oil tins. Besides these, the collectors possess no other equipment and their business does not require them to have any premises.

#### **(3) DAIRY FARMS.**

As stated before, the number is small but as most of them are Government-owned, they are properly designed and well-equipped, generally on western style. Modern cattle-sheds, milking byres, fly proof milk collecting and recording rooms and suitably designed dairies are found

at most, if not, at all farms. Some of the farm dairies have pasteurising and bottling plants, cold storage and washing up equipment. Sanitary milking pails and dairy churns (cans) are used at all the farms and are repaired or replaced according to necessity.

#### (4) DAIRIES.

Except for one or two large dairies at Bombay, the others are individually owned small concerns, each with one shop and no branches. The daily turnover of business is small and in many cases a net profit of Rs. 100 to Rs. 200 per month is all that the proprietor may expect to get. Very often after a trial of one or two years the business is given up and a new concern takes its place. In the circumstances, specially built premises or suitable fixtures and equipment cannot be expected. According to the ideas they possess, the proprietors make efforts to convert their shops consisting of one or two rooms into a dairy but as the building itself seldom belongs to them and also on account of the small turnover of business, no substantial expenditure is incurred on re-modelling the premises, providing the necessary fixtures and equipment or their proper upkeep. A few milk cans, weighing scales, measures, buckets and bottles comprise their entire dairy equipment. The dairies which handle pasteurised milk generally possess proper plant and equipment for the purpose together with a cold store.

#### (5) *Halwais* AND MILK VENDORS.

For them any premises are good enough so long as they are able to get a few customers and to retail 2 or 3 maunds of milk per day. The requirement of the business is such that the shops have to be in a street along with other shops and have an open frontage so that people can see that it is a *halwai's* shop. Sign-boards are usually absent. All of them have a hearth for heating the milk over charcoal or firewood but a chimney or a flue is never provided and the inside of the shop soon gets black with smoke. The rents of these shops are usually from Rs. 20 to Rs. 30 per month, but occasionally a shop, for example, near a railway station or a bus stand, may command a rent of even Rs. 75 to Rs. 100 per mensem without being more commodious.

A few iron pans called *karahis* for boiling the milk, some brass vessels used for measuring or receiving raw-milk and several galvanised iron buckets comprise the entire equipment of milk vendors or *halwais* and cost about Rs. 100 or so. For doling out milk an iron ladle is used but for the products, *e.g.*, *khoa*, hands are freely used. There are no arrangements for keeping away the flies or dust as these are generally impracticable at such shops.

#### F.—Methods of retailing milk and periods of delivery.

By four popular methods or practices, the consumers get their supplies of milk. These are (i) getting the producers' animals milked under supervision, (ii) having the milk delivered at their premises, (iii) purchasing it at the shops of the *halwais*, and (iv) drinking it at the last named shops.

**(1) MILKING OF ANIMALS UNDER CONSUMERS' SUPERVISION.**

Although possibilities of adulteration are even here not excluded, this is a method of obtaining milk when one hopes to secure pure supplies. Some of the institutions, *e.g.*, hospitals, also insist on cattle being brought to the premises and milked under supervision. For this purpose, the producers move their milch-cattle with the calves from door to door and milk them in the presence or under the supervision of the consumers. In some of the smaller towns as much as half of the supply is sold by this method. Smaller consumers generally go to the nearest house where the *gowala* milks the cow and obtain the milk. At many places the consumers visit the urban producers' holdings at milking times.

The practice has, no doubt, established itself as a result of certain circumstances but most of the consumers are unaware of the fact that the variations (often severe and abnormal) in the composition of milk of an individual animal are greater than in milk obtained from a herd. This aspect is of special significance when the milk is intended for infants, as is very often the case, when such arrangements are made. As cow milk is preferred for fluid use, the practice of taking animals from door to door is more common with cows.

**(2) DELIVERY OF MILK AT CONSUMERS' RESIDENCES.**

All dairy farms and dairies and a few collectors, *halwais* and milk vendors deliver milk at the residences of the consumers. It is generally delivered loose from a large can or vessel. These may not always be sealed. At times the consumers supply their own cans. Bottles are used only by a few farms and dairies and are usually of  $\frac{1}{2}$  pint, pint or quart size.

**(3) DELIVERY OF MILK FROM THE SHOPS OF *halwais* AND VENDORS.**

Persons who want boiled milk or whose requirements of milk are irregular or who, for some reason or other, do not wish to make arrangements with one supplier, call at the nearest *halwai* or milk vendor and purchase the required quantity of milk, on cash. They may bring their own vessels for the purpose or may receive the milk in a non-returnable earthen cup called *kulhar*. In Northern Indian towns and cities the latter practice is quite common.

**(4) DRINKING OF MILK AT THE SHOPS.**

The drinking of milk at the shops is popular only in Northern Indian cities and is confined to men. Sweetened milk is preferred for which an extra charge is made. Milk may be served in earthen *kulhars* or in metal tumblers. Many persons have the habit of drinking a *pav* of warm milk after dinner and thus more milk is drunk at the shops in the evenings than at any other time of the day.

**(5) HOURS OF MILKING AND DELIVERY.**

As in other parts of the world, milking is done twice a day but the hours depend upon the time when milk is to be delivered or is required.

in the market. Depending upon seasons (timings of sunrise and sunset) milk for fluid consumption is received at the markets generally between 6 A.M. to 9 A.M. and 4 P.M. to 6 P.M. The time of milking is adjusted according to the distance that is to be covered and is generally 2 to 3 hours prior to the time of delivery. In Kaira district, where large quantities of milk are delivered to the cream separating stations between 10 and 12 A.M., the milking is done after sunrise. On the other hand, at several dairy farms where a large number of animals are to be milked, it commences at 1 A.M., so that the consumers may get the milk before 6-50 A.M. At farms where pasteurisation is done, the morning milking commences at 3 A.M. The milk is received at the farm dairy 3 hours later at day-break. After processing and bottling, it is held in a cold store until 2 P.M. when it is issued for delivery to consumers before 5 P.M. Similarly, the hours for the afternoon milking are adjusted for delivery of processed milk the next morning before 6.

### G. - Cost of collection, treatment and distribution.

In countries abroad most of the milk is produced on farms in the rural surroundings and the bulk is consumed in urban centres which may be situated at a distance of many miles. In the circumstances the various services between the producer and consumer are well pronounced. These are (i) assembling of farm milk at collecting depots or "dairy points" as these are more commonly known, (ii) transport in tanks or in milk-churns by road or rail to the central dairy at the centre of consumption, (iii) processing, (iv) bottling, sealing and preparation for delivery and (v) distribution to the consumers. Some of these have necessarily to be performed by different groups of persons and accordingly their individual charges, say, per gallon of milk, could be worked out with considerable accuracy.

In India the fluid milk trade is intensely localised and the functions of the agencies engaged in it often overlap each other. The same person may collect the milk from the villages and retail it in the town. The practice of taking the milch animals to the residences of the consumers does away with even the above few intermediaries and the producer deals directly with the consumer. There is no large scale assembling and the primary seller has to incur practically nothing on "merchandising charges" as understood in the case of other commodities.

#### (1) COLLECTION.

The collectors who bring milk from villages generally do it on their own account. The cost of assembling and transport is met by them from the margin between their purchase and sale prices. The amount varies according to the charges, e.g., octroi, etc., if any, and the means of transport employed. At places the assembling or collecting charge may be negligible while at others it may involve a good deal of time and labour and money. It is, therefore, difficult to account separately for the cost of assembling the milk. The charges on transportation are discussed in a subsequent chapter.

In a few instances the seller is required to spend a little for selling his milk at a particular place. For instance, in the Bombay milk



market the trustees charge one anna per container irrespective of its size or the quantity of milk contained in it. If the milk is sold through a *dalal*, a further charge of 2 annas is levied on the seller. At the Jageswari Market, Poona, the Municipality charges a market fee of 2 annas per maund, but quantities below 10 lb. are exempted. At the Sealdah market in Calcutta, the charges are 8 oz. of milk *plus* 1 piece from each seller. At some of the other Municipalities also, there is an octroi duty on milk coming from outside and this ranges from 2 to 4 annas per maund.

## (2) TREATMENT.

A major portion of the milk is sold in its raw form and the consumers boil it before use. Only very small quantities (estimated to be not more than about 1,000 maunds per day) are treated on the western lines, *i.e.*, pasteurised at some of the Government farms and a few private dairies and farms. Quite appreciable quantities are, however, "boiled" at the *halwais'* shops for sale during the day and this may be taken as treating or processing of milk for the average Indian consumer. The average cost of boiling a maund of milk is given below:—

### *Cost of boiling a maund of milk for sale.*

(1945)

Items.	Approximate expenses
	Rs. A. P.
Fuel (charcoal, coke or firewood) .. .. .	0 8 0
Labour .. .. .	0 3 0
Shrinkage through evaporation (about 12 per cent at Rs. 10 per maund) ..	1 3 0
Total ..	1 14 0

The most expensive item is the shrinkage through evaporation. After boiling, the milk is kept simmering in the open pan and it is reported that by the time the lot is sold the shrinking is about 12 to 15 per cent.

The average cost of pasteurisation may now be taken as Rs. 2-4-0 to Rs. 2-8-0 per maund. The cost of distribution of pasteurised milk may be taken as Rs. 1-4-0 per maund. Assuming a price of Re. 1 per *seer* of pasteurised milk delivered in bottles, the cost of processing etc. works out to about 8 per cent.

These figures show that, provided the milk business is organised on a sound commercial basis, pasteurisation and proper distribution will not much increase the cost of milk as is commonly felt by the lay-man, whereas the quality of the milk delivered would be considerably improved.

### (3) DISTRIBUTION.

Generally the producers, village collectors, retailers and milk vendors themselves deliver the raw milk to the consumer. Very often the consumers or their servants visit the urban producer's holding or the *halwai's* shop and carry home their requirements of milk. At the former, they may get the animals milked in their presence. The *halwais* themselves may also go and deliver raw milk to their clients at their houses and may not employ any labour for this. Only the bigger *halwais* and dairies keep special men to go round and distribute milk. These are employed on monthly emoluments and are paid Rs. 15 to Rs. 20. The labour charges on distribution of milk are thus reckoned to be 6 to 12 annas per maund. Most of the milk is delivered loose from large cans and hence there is no charge for bottles or caps. Deliveries are generally made on foot although bicycles are becoming increasingly popular. Those who drink milk at the shops are served in earthen cups called *kulhars* which cost 12 annas to Re. 1 a hundred according to size. They generally hold  $\frac{1}{4}$  or  $\frac{1}{2}$  seer of milk.

The bulk of the pasteurised milk is distributed loose from cans which have a tap at the bottom. The lid of the can is sealed and plungers are generally not provided. Part of the supplies are distributed in bottles of pint and quart size, sealed with paper or metal caps. They are delivered at the residences of customers through motor vans, horse-drawn milk-floats or bicycles. The cost of distribution by the dairies has been given in the previous section. It is stated that the investment and breakages on bottles are considerable. The average life of the bottle is said to be about 100 trips or about  $3\frac{1}{2}$  months, one bottle doing only one trip a day. On this basis for distributing 100 lb. of milk in pound size bottles, approximately 30 bottles are to be replaced every month. The cost of 1 lb. bottles of English or American make is about Re. 1 each. As they are to be imported, the dairies have to carry large stocks. In the case of the Government farms which import bottles direct from the manufacturers about 12 months' stock is always maintained. In other words for 100 pounds of milk sold daily, approximately 360 bottles are kept in stock besides those in circulation.

### H.—Finance of milk marketing.

A sufficient number of milch animals and provision for their proper feeding are essential for the regular production of milk. Few producers are, unfortunately, wealthy enough to do this without substantial monetary help from outside. Banking in India has not developed to the extent that it can claim to advance money to petty milk producers. Lending of money for the purchase of livestock is considered to involve greater risks than giving it for other enterprises. These circumstances, therefore, reduce the number of agencies from which a milk producer can obtain loans to only one, namely, the party which requires his milk or products.

## (1) PRODUCERS' ARRANGEMENTS.

The onus of financing the rural producers falls mainly on the collectors who depend upon the former for the supply of milk or products. In certain tracts, *e.g.*, Khandesh in the Bombay Province where the village merchants deal directly with the producers, they give in some cases a loan up to Rs. 1,000 to enable a producer to purchase milch animals and supply them with country butter. In other parts, milk collectors who deal with *haliwais*, milk vendors and dairies, in turn take advances from them for giving to the producers. These financiers of the milk trade may themselves have to borrow very often from some private money-lenders. Similarly, the producers too may have to purchase animals on instalments as the loan may not cover the entire cost of purchase.

Urban producers are better placed than their rural cousins in the matter of obtaining loans. They are generally able to secure better prices for their milk and when in need of money, they can always take a short term loan from some money-lender. It is observed that on account of competition, money-lenders advance money readily even for such apparently risky investments, as the purchase of milch-cattle.

The amount of loan, rate of interest, if any, and period of re-payment depend upon the quantity of milk produced or handled daily or monthly, its prevailing market price and the general well-being, reputation and previous connections of the debtor. Amongst the agencies engaged in the milk trade itself, competition is practically absent and the utmost care is taken to advance as little and to recover as early as possible.

Generally speaking, producers, collectors, and retailers do not disturb or change connections frequently and in many instances the three deal in the same group for several years. For this reason, loans are often given without any written agreement. It is a common practice, however, to come to an understanding beforehand regarding the quantity of milk which would be supplied daily, and shortages, if any, are made good through purchase from others at the risk and cost of the supplier. Similarly, there is a conventional quality clause that the milk shali yield an outturn of *khoa* equivalent to 25 per cent. of the weight of buffalo milk, and in case this falls short on a surprise checking, necessary deductions will be made from the total quantity supplied during the previous 7 days. New producers or collectors may, however, have to execute a deed and interest varying between 1 pice to 2 pice per rupee per month (approximately 19 to 38 per cent. per annum) may also be charged. In the case of old clients, interest is ordinarily considered in the price itself and a separate charge is not made. Sometimes, there may be an understanding to supply, say  $2\frac{1}{2}$  seers extra milk free of charge for every maund in lieu of interest. Although practices vary in different areas and often differ with transactions in the same areas, it is observed that about Rs. 75 to Rs. 100 are allowed per animal in milk which a producer may possess and whose milk he has agreed to sell to his creditor. If the yield is, say, 5 seers per day and the price Rs. 10 per maund, the above loan equals approximately to the value of two months' milk yield from one animal. Towards repayment of the loan, the collector deducts a small amount every week or fortnight at the time of settling the

account. This system of realisation enables the producer to repay his loan conveniently. But the producer may again ask for a further sum and it is observed that a loan of about Rs. 75 to Rs. 100 per animal remains outstanding as long as it is in milk.

Thus when the cattle run dry or give very little milk, the producer is unable to draw further loans and to repay the debt. At this juncture, he feels most the financial stringency in maintaining the cattle. Invariably, the only alternative left for him is to cut down his expenses to the very bone and discontinue feeding the cattle on purchased feeds and to leave them entirely on grazing or a little fodder which he may have of his own. It also happens that out of 4 or 5 animals, he may adequately look after at the most only one or two during their dry periods and neglect the rest. In this respect the young stock suffer the most. The effects of starvation during the dry period or during the period of growth of a dairy animal are too well-known and it is here that there is great need for financing the producers in order that the animals may yield a reasonable quantity of milk when they calve again.

In East Punjab and the United Provinces, when the animals in urban areas go dry, they are sent back to rural areas. In these provinces there are in the villages a set of people (called *charwahas*) who undertake to look after such cattle on a system known as *adhiari*. Under this the owner pays to the *charwaha* half the value of the animal assessed by a third party at the time of calving. Young calves are also sometimes reared under this arrangement. Dry cows from the Madras city are sent to the northern districts, such as the Ongole tract, to be sent back when they calve. The business is in the hands of middlemen who despatch the animals from Madras and arrange for their maintenance during the dry period. Recently, a co-operative society has been organised in the Madras city which arranges to send the dry animals to adjoining Reserve Forests for maintenance. However, such facilities do not exist everywhere even in these provinces. The co-operative societies of the future should consider making similar provisions to meet the above need. On account of the expenses of feeding which the producers cannot afford, the value of heifers remains generally low and quite promising animals could be purchased for Rs. 20 to Rs. 30 per head. The societies might, therefore, purchase these and after rearing them properly return them to the members when they are due to calve.

In the post-war dairy development schemes, organisation of producers' co-operatives in rural areas and linking these societies with a Milk Union or a suitable central processing organization in urban areas, have been accepted as the best means of bringing about a rapid increase in the production of milk. Various types of assistance are to be provided to the producers through the Milk Unions and primary societies. The most important one is the grant of subsidies and also loans at nominal rates of interest for the purchase of dairy equipment, milch cattle etc. These loans are recoverable in easy instalments extending over a responsible period. Steps are also being taken to develop a

“Cattle Insurance Scheme” for the better protection of the rural producers who would have to invest considerable sums of money on good animals.

## (2) WHOLESALERS' AND RETAILERS' ARRANGEMENTS.

Besides giving loans to collectors, the wholesalers and retailers have to arrange for running their day to day business. A major portion of their daily turnover remains outstanding with customers for at least a month or so, when only the regular clients clear their accounts. For equipment and shop fixtures also, an average *halwai* has to invest Rs. 300 to Rs. 400. An enquiry in the above direction in cities of Northern India showed that for handling about 2 to 3 maunds of milk per day a *halwai* has to invest something like Rs. 750 to Rs. 1,000 and this sum remains invested throughout the year. In most cases, it is his own money, but sometimes it may be borrowed from a money-lender at the rate of 12½ to 25 per cent. per annum.

The dairies have monthly accounts with institutions only but for private customers, they sell coupons in advance which are exchanged for the milk as and when required. A coupon book is generally for 30 lb. of milk or so, which may be a family requirement for about a week or 10 days. Thus, the dairies get about a week's payment in advance from their clients.

The coupon system is particularly useful in the distribution of small quantities of milk to a large number of consumers. It ensures not only advance payment but also does away with bad debts and minimizes to a large extent the keeping of petty personal accounts. Paper coupons are generally used and their cost is quite considerable particularly when the quantity exchanged per coupon is small.

## CHAPTER V.—TRANSPORTATION.

### A.—General.

Regularity, cheapness and speed are the three important essentials in the transport of a highly perishable and bulky commodity such as milk. In India, the land of distances, there is great need for developing efficient long distance transport. There are important consuming centres which can take in more milk if only it could be cheaply and efficiently transported from the distant producing areas. The railways in other countries have played a useful part in supplying distant milk to the consuming centres: for developing the milk trade in this country also the fullest co-operation of the railway authorities is required.

### B.—Methods of transport.

As already pointed out in Chapter IV, assembling and transportation of milk is undertaken by a very large number of persons and the quantities handled by each one of them at a time vary considerably, e.g., from a few seers to several maunds. A notable feature of Indian transport is that, due to the warm climate of the country, the service

has to be performed twice a day, morning and evening. The mode of transport depends upon the distance of the supplying village and the quantity handled during the trip. The main forms of transport are head-loads, shoulder slings (*bahangis*), pack animals, bullock carts, bicycles, *tongas*, lorries, railways and boats, depending upon local conditions. It is, therefore, difficult to give with any precision the percentage of milk transported by the various methods for even a tract much less for the whole country. A brief description about each one of them follows together with the approximate cost incurred in different parts of Indian Union.

#### (1) HEAD-LOADS.

This form of transport is generally employed for short distances and small loads and is common throughout India. In the hill tracts it is by far the most important (*see* plates facing page 114 and this page). The plate at the bottom shows a milk-can packed in a crate ready to be transported from Tangmarg to Gulmarg in Kashmir, a climb of 1,800 feet in  $3\frac{1}{2}$  miles.

Producers and small collectors carry the milk to the nearest town in earthen or brass pots, galvanised iron cans, buckets or kerosene oil tins (*see* plates facing this page). The quantity carried per trip varies between 15 and 25 seers and the distance traversed is from 2 to 5 miles. Generally, only one vessel is carried on the head but sometimes two or more vessels may be placed, one upon the other. Transporting by other methods is done exclusively by men but in this case women are also employed.

It is difficult to give with any accuracy the cost of transport by this means, for the producers or collectors themselves carry the milk. Hired labour is seldom employed for the purpose and if at all, it may be used for other jobs during spare hours. Assuming the wage of a man to be one rupee per day and the quantity transported during the two trips to be a maund over a distance of, say, 3 miles and that 50 per cent. of his time is spent on this work, the cost comes to 3 annas per maund per mile.

#### (2) *Bahangis* OR SHOULDER SLINGS.

This form of transport is similar to head-loads and is meant for short distances but for bigger loads. The quantity of milk carried at one time may be up to a maund and several vessels, placed one upon another, may be employed (*see* plates facing this page). *Bahangis* are used all over India. As in the case of head-loads, it is difficult to give accurately the cost of *bahangi* transport but it is slightly cheaper and may be taken to be about 2 annas per maund per mile.

#### (3) PACK ANIMALS.

Ponies and horses in the East Punjab and donkeys in Saurashtra are employed for transporting milk. In the other parts of the Indian Union, their use is not common. This form of transport is employed by producers and small scale collectors. The quantities carried are up

to two maunds, over a distance of 4 to 6 miles. The animals are owned by the producers or collectors and are maintained quite cheaply under village conditions. It is reported from the East Punjab that the cost of transport on horse-back may be taken to be 2 annas per maund per mile.

#### (4) BULLOCK CARTS.

This form of transport is not very common in any part of the country. In the Central Provinces and Berar, Cochin and other parts of the South, bullock carts are employed to some extent for transporting milk. Even there, the use is restricted on account of the small quantities handled and the extreme slowness of this means of transport. However, in certain areas where manufacture of cream and creamery butter are well established and large quantities are transported at a time, *e.g.*, at Anand, bullock carts are usefully employed. Plate facing page 115 shows transport of milk in cans to a butter manufactory in Gujrat. A bullock cart can travel about 4 miles per hour and can carry a load of about 8 maunds of milk in churns. The charges for a bullock cart in villages are about Rs. 2 to Rs. 3-4-0 per day. When, therefore, a bullock cart carries about 8 maunds of milk for a distance of 8 miles twice a day, the cost of transport works out to about 6 pies per maund per mile.

#### (5) BICYCLES.

Being quick and handy, this form of transport is popular in all parts of the Union. The collector on bicycle is able to reach the producers' holdings in villages inaccessible by other means of transport except on foot or horse-back. The plates opposite page 116 show milk being carried on bicycles in *ballois* and galvanised iron cans. A collector can generally carry with ease about 30 seers of milk per trip but many a time even bigger quantities are transported (*see plates opposite page 116*). The time taken to traverse a distance of 8 miles is about an hour and a half.

The cost is difficult to estimate. The collectors and producers transport the milk on their own and are not employed by others. They usually make two trips a day. The bicycle and other equipment are owned by them.

#### (6) TONGAS

These are used by collectors and producers who transport larger quantities of milk, say, 4 maunds per trip, from villages situated on roads, both metalled and unmetalled. The carriages are of a special pattern having a flat and uncovered body drawn by a single horse or pony. These are generally owned by the producers or collectors but at times milk may be transported in hackney carriages. This happens only when the quantity of milk is small and there is a regular plying of such vehicles between the village and the consuming centres. The milk containers are placed under the seats and the owner has generally to pay only his own fare.

## (7) MOTOR LORRIES.

With the extension and improvement of roads during recent years, the lorry transport is becoming increasingly popular. Milk from villages not connected by rail and situated at distance of 10 miles and beyond is transported by means of lorries. It has an advantage over rail transport as the owner is saved the trouble of carrying it to and from the railway station. A lorry can be stopped at any place *en route* for loading and unloading. Even at places where both rail and lorry transports exist, the latter has proved to be a serious competitor of the former. As with the railways, drivers of lorries allow one or two containers to be carried free per person and for the extras a nominal charge is levied. Special lorries are engaged by co-operative societies and milk unions for transporting milk purchased from members to towns and cities. Some large dairies also use special lorries.

## (8) RAILWAYS.

There is at present very little traffic in milk by rail. This is particularly so in the case of milk consignments booked as such. The only exception is the transport of milk churns in specially insulated vans from Anand in Khaira district to Bombay, by Mail trains. On some of the principal railways, milk may be carried over short distances by rail with the milkmen themselves on monthly passes, or under market vendors' passes. These are obtainable for monthly service on payment of only 24 fares and allow  $1\frac{1}{2}$  maunds of milk to be carried against only 25 seers, the usual allowance of a third class ticket.

On some sections, *e.g.*, between Serkhej and Ahmedabad, a part of the third class compartment may be set apart for the milk carriers by the morning and evening trains going to Ahmedabad. Similarly, on the suburban trains going to Bombay a third class compartment may be set aside for milk traffic.

The freight by passenger trains on luggage and parcels is based on a general tariff fixed by the Indian Railway Conference Association. These rates are known as the full parcel rates and are published in Coaching Tariff issued by the above body and are ordinarily applicable to all the railways in India. Most of the perishable commodities are charged at half parcel rates and milk is one of them. Besides milk, curd is the only other dairy produce which is charged at half parcel rate, *khao*, cream, butter and ghee being charged at full parcel rates. Freight on articles charged at half parcel rates must be prepaid. The instructions say that "dairy produce will not be accepted unless tendered for despatch in properly covered receptacles". The containers or parcels are charged on gross weight. The empties on return journey are carried at one-fourth parcel rate. On the English railways the freight is charged only on the net weight of milk and the containers are carried free on



### Railways freight\* on milk.

(The tare of the can is taken to be as 25 per cent of the weight of the milk contained in it.)

Distance.	Freight on milk at $\frac{1}{2}$ parcel rate excluding can.	Freight on container at $\frac{1}{2}$ parcel rate for forward journey.	Freight on return of empties at $\frac{1}{2}$ parcel rate.	Total freight on milk.
	(Per md.)	(Per 10 srs.).	(Per 10 srs.).	(Per md.)
	Rs. A.	Rs. A.	Rs. A.	Rs. A.
Up to 25 miles .. .. .	0 3	0 3	0 2	0 8
Over 25 miles but not exceeding 50 ..	0 6	0 3	0 2	0 11
Over 50 miles but not exceeding 100 ..	0 12	0 4	0 2	1 2
Over 100 miles but not exceeding 150 ..	1 1	0 5	0 3	1 9
Over 150 miles but not exceeding 200 ..	1 4	0 5	0 3	1 12

The Railway Board has allowed special rates and certain other facilities for the long-distance transport of milk from Anand to Bombay (see page 172).

### (9) BOATS.

In the United Provinces, Bihar, Bengal and Assam and in Cochin and Travancore, a small proportion of milk is also transported from the villages to the consuming centres by boats. At Hardwar, an important place of pilgrimage on the Ganges, milk is assembled, and transported by means of what is known as *tamer* (see plate opposite page 117). Several milk tins are placed and tied together on bamboo pieces by means of ropes. The whole assemblage floats on water and the owner sits on the tins and rows it like a boat.

### C.—Development of refrigeration and refrigerated transport for milk.

The number of refrigeration units and cold stores in use at present are confined to urban centres; their capacity is not sufficient even to handle the existing business offered. There is no doubt that if refrigeration is adopted on a larger scale in the collection, transport, processing, storage and distribution of milk, losses in handling could be minimised and the quality of the products also will be improved. By assuring a market and more income to the rural producers, production will also automatically increase. It would probably take some time owing to

\*Excluding surcharge.

scarcity of equipment to develop refrigeration to the desired level, but by planned operation it is possible to achieve substantial results in five years. To develop "milk pockets" satisfactory arrangements would have to be made for chilling the milk in the producing areas as soon as it is collected, and provide refrigerated transport to consuming areas. Motor collecting vans with a refrigerating unit installed in them may be tried for assembling the milk together with long distance rail transport of the chilled milk.

It is the rail transport of milk over long distances, in refrigerated condition, that forms the main "bottle neck" in the development of a profitable market for surplus milk procurable in rural areas, consequently in the development of dairying in these areas. It is obvious that, for milk traffic, a daily service is indispensable and the timings between the loading stations and the destinations should be suitable to the requirements of the trade. The question of freight is of utmost importance both from the point of view of the railways and the trade. Now the railways insist on a guarantee for a certain minimum haul before they would entertain proposals for providing a special refrigerated van and freight charges for the transport of milk and the return of the empties are so high as to kill the trade, rather than foster it. The right way for securing this traffic would be for the railway administrations to carry out demonstration and propaganda to impress upon the trade the advantages of refrigerated transport. The railways by adopting a liberal attitude can go far in fostering this type of dairy development.

The B. B. & C. I. Railway administration has constructed seven insulated vans, each of 11 tons capacity which are now used for transporting about 500 maunds of chilled pasteurised milk daily from Anand to Bombay. Possibilities of developing similar traffic from distant producing areas to urban centres like Calcutta, Madras, Kanpur, Lucknow, etc. are for detailed investigation.

In case the transport of hot pasteurised milk develops, as envisaged in a previous chapter, the refrigerated vans would not be necessary and railways would only be required to fit up existing vans with proper shelves for placing insulated milk churns.

#### **D.—Types of containers, their defects and suggestions for improvement.**

Different types of containers are used in the milk trade at its different stages. They may be made of tree-leaves baked-earth, wood, or bamboo. Metal pots, generally of brass, earthen pots, galvanised iron cans, buckets and second-hand kerosene oil and petrol tins are also used. Many of these are without lids and the explanation given is that as the owner always accompanies them, lids are unnecessary. It is for this reason that the railways have particularly laid down in their rules that dairy produce can only be booked provided it is tendered in properly covered receptacles. Imported churns are used only by the larger firms and dairies.

Vessels made out of bamboo are generally used in Assam for milking the animals and as measures for retailing milk (*see* plate on opposite page). Hollow pieces of bamboo about 3 feet long called *chunga* for holding about 5 seers of milk are also used for transport in the hills. Shallow cylindrical pans carved out of blocks of wood are used at many places throughout India for curdling. Earthen vessels are also used for the purpose. These vessels are said to maintain the temperature more uniformly, so important for obtaining good texture in curd. Small receptacles, called *dauna*, made by joining leaves of certain trees\* are used by *halwais* for retailing curd, *malai*, etc. They hold about 8 oz. of milk or products and could be had at about 4 to 8 annas per 100. Tumbler-shaped *kulhars* made of baked earth are used for retailing and drinking of milk at shops. These cost about 12 annas to Re. 1 per 100 depending upon the size which ranges from  $\frac{1}{2}$  to 1 lb. Imported glass bottles are used by a few dairies and Government farms for distributing milk.

Brass pots called *batloi* are used for milking. Smaller vessels called *lota* and *garvi* are used as milk measures (*see* plate on opposite page). Larger sizes containing up to about 20 seers are used for transport on cycles, ponies, *tongas* and head-loads. Their sizes and shapes vary in different tracts. Most of them seldom have any lids; grass, leaves, cloth or paper plugs may be used for closing their mouths (*see* plates facing page 119, 120 and 151). At places, a lid may also be sometimes provided. All brass pots are sold on the basis of weight and their re-sale value is highest of all the containers.

Kerosene oil tins, with or without lids, and galvanized cans with lids are used for transporting milk by road or rail. Their prices fluctuate according to the price of iron sheets and 4 gallon cans with bow handles for carrying on cycles could be had for about Rs. 12 to Rs. 15 each. They last for 2 to 3 years and are made in most of the towns. The finish is rather poor and a 4 gallon can has about 125 inches of soldered joints which harbour dirt and cannot be cleaned efficiently.

In Kaira district, can making is better developed than in other areas. They are made by hand driven machines and there are some half a dozen small factories for supplying such containers to the local milk and cream trade. Instead of galvanized iron sheets, heavy quality tin plates are used (*see* plate facing pages 120 and 121). Imported cans or churns of various sizes are used by Government farms and some of the large private dairies (*see* plate opposite page 121). Only two or three firms import them in India. The prices are high.

The question of manufacturing milk containers locally on a large scale, suitable for Indian conditions is of considerable importance in the development of dairying in this country. In other countries, designing and manufacturing of containers have received special attention of the trade, transporting agencies and of the Government departments.

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\* Usually of banyan tree—*Ficus bengaleuris*.

Manufacturers of pressed utensils in India should examine the question of introducing a cheap, light and strong container suited to the Indian milk trade. Special attention should be paid to provide facilities for easy cleaning of the containers as the designs used at present are defective in this respect. Scalding water and scouring agents are not available or used in the villages and this aspect should be kept in mind in designing the container. For handling and transport of hot pasteurised milk as explained in the previous chapter, the milk churns will have to be insulated. The recommendations of the Milk Sub-committee in this matter have already been indicated (*see* page 104).

#### **E.—Losses through souring during transit.**

Although long distance transport is not yet in vogue in this country, it is reported from most of the areas that during summer the collectors suffer monetary losses due to the souring of milk, brought even from nearby villages. In handling unchilled milk particularly in the hot season when the day temperature in shade often exceeds 100°F, such losses are unavoidable to some extent. Insanitary conditions in production and handling no doubt greatly help souring with the result that during summer, in most parts of the country, village milk can hardly remain sweet for more than 4 hours after milking, unless it is boiled. Bringing milk from distant villages situated at more than 5 miles is, therefore, often discontinued during summer. In order to prevent the heating up of the outside of the cans, pieces of gunny are tied around them and these are kept wet. Bits of straw and leaves are also put inside the milk and it is claimed that they help to aerate the milk and prevent it from souring. It is reported that preservatives such as boric acid and even formalin (poison) are used during summer to prevent souring of milk but it has not been possible to detect any sample containing these.

Precise information regarding the extent of loss in all the areas is not available, but enquiries made in this connection showed that a collector may lose as much as 5 to 7 days' supply of milk through souring during the summer season. The curdled milk is generally thrown away but may at times be fed to cattle.

#### **F.—Transport of milk in foreign countries.**

Considerable attention has been paid in foreign countries to clean milk production in the farms and 'safe' and expert handling during transport over long distances. The methods\* adopted in England may be briefly discussed in this connection:—

The subject divides into transport by churns (cans) and transport by tanks in connection with the liquid milk market. The following three classes of distributors are concerned:—

(a) the producer-retailer who handles upto 100 gallons daily, entailing direct delivery from farm, or small dairy to consumer. (b) the medium sized dairyman, handling upto 2,000 gallons daily. Raw milk,

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\*Abstracted from "Dairy information (1947)" by H. B. Cresshaw.

collected from considerable distance, is sent direct from farm to dairy, in churns, by road or rail and (c) large dairies handling over 10,000 gallons daily. Farm milk is assembled in country depots where it is bulked and usually refrigerated (*i.e.* cooled below 40°F) before despatch to the consuming centre in road or rail tanks or possibly in churns.

The fact that the keeping quality of bulked milk is determined by the quality of the worst individual supply to be included in the bulk is realised and every endeavour made to produce milk as cleanly as possible, for its rapid assembling and preliminary cooling in farms.

### (1) CANS.

For the transport of milk from individual farms and for the supply of small quantities to retailers, the churn offers very many advantages. The English churns are made of tinned steel but a 10 gallon churn, weighing 34 lb. and assuming it is 85 per cent. full, would account 29 per cent of the total load. The question of using light-metal alloys to save unnecessary dead weight had engaged the attention of the trade.

To simplify construction of lorry platforms and to improve the efficiency of churn washers and other handling equipment, the standardisation committee of the Society of Dairy Technology has made certain recommendations to the Council of the Society in March, 1945.\* For the 10 gallon churn, the maximum diameter suggested is 13½ inches, overall height 29 inches and diameter of neck between 8½ and 9 inches. The length of taper of the neck should be sufficient to ensure quick drainage, easy cleaning and accurate gauging. The mush-room type of lid with proper provision for sealing was recommended. A bottom flished downwards to an extent sufficient to ensure adequate strength, complete drainage and efficient cleaning, fabrication in tinned steel of gauge 16, weight about 33 pounds, handles not projecting beyond the body line and firmly attached to the shoulder and for additional strength to the taper, was deemed suitable for adoption as standard by the Society of Dairy Technology.

### (2) TANKS.

Compared with the churn system, the tank system of transport saves much time and the labour involved in the handling, filling and emptying of a number of small containers. Also, it is cheaper and often quicker. Tank transport, however, necessitates sufficient storage capacity at each end of the journey.

The main design problem is the reduction of weight to the minimum consistent with strength and sanitary features. Road tanks in use carry 700—3,200 gallons. The cross-section is usually circular. The finish is smooth and the corners radiused to facilitate cleaning. Fittings include a seal-manway; outlet, and lockable cock; a pressure-vacuum release valve; and transverse baffles to relieve surging. The shell is usually insulated.

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\* A special technical committee has since been set up by the British Standards Institution for drawing standard specifications for milk shuras.

Rail tank construction is similar, but the problem of mounting is simpler as a railway wagon forms a rigid and level support.

The general opinion is that existing road conditions and restrictions\* limit the usefulness of road tanks for distance over 100 miles.

Regarding material for construction of tanks, stainless steel has the advantage of **strength, durability** and ease of cleaning. It is, however, costly and fabrication is difficult. Aluminium is light but demands greater care in cleaning. Glass-lined steel is easy to clean; is also **rigid** and strong, but is heavier and hence more suitable for rail tanks. Mild steel, coated with synthetic resin is a more recent development which is under-going trial.

## CHAPTER VI.—QUALITY OF MARKET MILK.

Milk is a natural product and its composition varies considerably with the species of animals secreting it. Milk from animals of the same species may also differ in composition from day to day. Thus there is no absolute uniformity in the quality of even natural unadulterated milk. This has been a cause of some difficulty in fixing legal standards for market milk.

On account of its widespread and almost universal use, its comparatively high cost as a food product and the ease with which it can be adulterated, a number of malpractices have entered the milk trade in almost all countries of the world. In most of them, they have been effectively checked through Government intervention and control and through mutual efforts of the trade and the consumers alike. Although the public health authorities in India are fully empowered to control the quality of milk put on the market the results achieved during the last quarter of a century leave much to be desired. At present milk and ghee are perhaps the two most adulterated foodstuffs and owing to the superficial nature of official control on quality, it is difficult to obtain them in pure form. This one factor alone—lack of control on the quality of market milk—has been very largely responsible for the lack of expansion of the industry in India on the right lines. Further, milk is liable to bacterial contamination but, there are no bacterial standards; and, very little or no attention is paid toward production of clean milk as understood by the dairy world at large.

Before dealing with the quality of market milk, a brief description of the composition of milk in general and that of Indian cows and buffaloes in particular may be of interest.

### A.—Composition and general characteristics of milk.

Genuine milk is an opalescent white liquid with a sweetish bland taste. Milk contains water, fat, caseinogen, albumin, milk sugar and

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Capacity of a road tank is limited by the maximum legal gross running weight; 12 tons for 4-wheeled, 19 tons for 6-wheeled and 22 tons for 8-wheeled vehicles. The cost per gallon of the smaller tank is nearly double that of the larger tank.

salts. It contains two phosphatides (lecithin and cephalin), gases, traces of urea, cholesterin, etc., to some of which the characteristic flavour and smell of milk is due. It is too voluminous and contains too little iron for the sole diet of adults, but it is undisputably a very important source of fat-soluble vitamins, of proteins of good quality, and of calcium salts. The fat is suspended in the aqueous portion of the milk (milk plasma) in the form of globules, from 0.0015 to 0.01 m.m. in diameter. On standing for some time, a separation of the part of the fat takes place, the larger fat globules of the milk naturally rising first. Absolutely fresh milk has an amphoteric reaction, but reaches the consumer faintly acid owing to some slight production of lactic acid through fermentation.

### B.—Composition of Indian milk.

The milk of cows, buffaloes and goats varies considerably in composition particularly in respect of fat content. The milk of various breeds of the same species also differs to a great extent. In the sub-continent of India with varying climatic and soil (fodder) conditions, there are a large number of breeds of cows, buffaloes and goats. Some of these breeds may show points of similarity, but many have little in common either in their conformation, characteristics or utility. The names of 29\* more important breeds of cows, 12 of buffaloes and 12 of goats are indicated in the table below:—

*Important breeds of cows, buffaloes and goats with names of tracts where they are commonly found.*

<i>Cow breeds</i> ..	Alambadi (Coimbatore, Salem and Bangalore); Amritmahal (Western & Central parts of Mysore); Bachaur (North-west Bihar); Burgaur (Coimbatore); Dangi (North Bombay Province); Deoni (Northern and Western portion of Hyderabad); Gaolas (Central Provinces & Berar); Gir (Saurashtra); Hallikar (Tumkur, Hassan and Mysore districts and adjoining parts of Bombay and Madras Provinces); Haryana (Rohtak, Gurgaon, Karnal and Hissar districts of East Punjab and Delhi); Hissar (Hissar district of East Punjab); Kangayam (Coimbatore district of the Madras Province); Kankrej (North Bombay Province); Kenwariya (Banda district of U. P.); Kherigarh (North-east U. P.); Khillari (South Bombay Province); Krishna Valley (S.E. Bombay Province); Lambadi (Hyderabad); Malvi (Madhya Bharat, North-western parts of C.P.
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\*For full description of these breeds see (i) Report on the Marketing of Cattle in India, and (ii) Report on the Marketing of Sheep & Goats in India.

*Cow breeds.--contd.*

and North-eastern parts of Hyderabad); Mewati (Kosi tract of Mathura district and Matsya Union); Nagori (Jodhpur); Nimari (Nimar district of C.P. and Khargaon district of Indore); Ongole (Nellore and Guntur districts of Madras Province); Ponwar (Pilibhit and Kheri district of the U.P.); Rath (Madhya Bharat); Sanchore (Jodhpur); Shahabadi (Shahabad district of Bihar); Siri (Darjeeling, Sikkim and Bhutan); Sitamarhi (N. United Provinces & Bihar).

*Buffalo breeds*

- .. Banni (Saurashtra); Charotar (North Bombay Province); Jaffarabadi (Saurashtra); Mehsana (Mehsana district of Baroda and the adjoining areas); Murrah (Rohtak, Karnal, Gurgaon and Hissar districts of East Punjab and Delhi); Nagpuri or Ellichpuri (Nagpur, Wardha and Berar districts of the Central Provinces and the adjoining parts of Hyderabad); Parlakimedi (Parlakimedi estate of Orissa); Pandharpuri (S. E. Bombay Province); Sahidpuri (Assam); Surti (Khairat district in Bombay Province); Toda (Nilgiris district of the Madras Province); Tellingana (Madras Province).

*Goat breeds ..*

- .. Barbari (East Punjab, U. P., Madhya Bharat, Central Provinces and Hyderabad); Berari (Berar, Nagpur, Wardha and Nimar districts of the Central Provinces); Bikaneri (Bikaner and the adjoining areas of the Punjab, U. P., and Rajasthan); Cutchi (Saurashtra); Ganjani (Ganjam district of Orissa Province); Jamnapari (U.P., Vindhya Pradesh and Madhya Bharat); Kanchi (Hyderabad); Kathiawari (Saurashtra and N. Bombay Province); Kel or Pashmina (Tibet and Northern parts of the Ladakh district in Kashmir); Malabar (Malabar Coast); Surti, Khandeshi or Nimari (Bombay Province); Tellingani (Hyderabad and Chanda district of the Central Provinces).

The earliest records of analysis of milk of Indian cows and buffaloes are of Simpson and Stevenson at Calcutta in 1889. Cow and buffalo milk at Bombay and Madras were analysed by Leather in 1899 and 1900. Since then several analyses have been made at various laboratories. Unfortunately the records do not contain particulars



regarding the breeds of cows and buffaloes whose milk was examined. The methods of analysis also varied with different workers. Data on the composition of milk of all the breeds mentioned above are still not available.

### (1) COW MILK.

The most outstanding characteristics of cow's milk is its slightly yellowish colour. Cow's ghee is definitely yellow. Cow's milk is said to be more sweet and pleasant in taste than buffalo's milk.

The data available on composition of milk (fats and solids-not-fat) of some of the more important breeds are given in the following table:—

*Composition of milk of different breeds of cows.*

Breed.	Number of samples examined.	Specific gravity at 60°F.	Fat.	Solids-not-fat.	Authority.
			Per cent.	Per cent.	
Ongole .. ..	48	..	5.05	..	Dairy Institute, Bangalore (1927).
Sindhi .. ..	..	1.030	4.84	8.42	Agri. Institute, Allahabad (1938).
Sindhi .. ..	2,500	..	4.65	8.69	Dairy Institute, Bangalore (1940).
Gir .. ..	730	..	4.54	9.15	Do.
Tharparkar ..	50	1.031	4.60	9.63	} Cattle Breeding Farm Karnal (1934).
Haryana ..	40	1.031	4.60	9.68	

### (2) BUFFALO MILK.

Buffalo milk is prized for its richness in fat. On an average, it tests 2 to 3 per cent. higher in fat compared with cow's milk, but solids-not-fat exceeds cow's milk by less than 1 per cent. In the case of buffalo milk, analytical figures are available only for the Murrah buffalo. They are indicated below:—

*Composition of milk of murrah buffalo.*

Breed.	Number of samples examined	Fat.	Solid-not-fat.	Authority.
		Per cent.	Per cent.	
Murrah ..	Annual average of daily herd tests.	7.3	9.25	Agricultural Institute, Allahabad (1938).
Do. ..	2,200 herd samples ..	6.75	9.50	Dairy Institute, Bangalore (1940).

The above are herd averages but milk of individual animals often contains 10 per cent. fat with equally high proportion of solids-not-fat. The buffaloes (generally of Murrah breed) kept at the Bombay City stables yield milk which contains above 7.5 per cent. fat.

### (3) GOAT MILK.

The study of the composition of goat milk has received least attention. This milk has generally a characteristic flavour. It is, however, said that if instead of feeding the goats on tree leaves, which is the common practice, grass and grain mixture is fed and if the male is kept separate from the females it is possible to produce quite odourless milk.

So far as is known, only one set of reliable figures on fat content of goat milk is available. This relates to the two breeds, Jamnapari and Barbari kept at the Mission Farm, Etah (United Provinces).

*Fat content of goat milk.*

Breed.								Number of goats tested.	Fat per cent.
Jamnapari	..	..	..	..	..	..	..	215	5.2
Barbari	..	..	..	..	..	..	..	150	4.9

The above figures are averages of day-to-day analysis of herd milk for 6 years, from 1932 to 1937, carried out under a goat breeding scheme financed by the Indian Council of Agricultural Research. They show that milk of the goats of the above-mentioned breeds is of the same richness as the milk of the Indian cows.

### C.—Factors affecting the composition of milk.

The milk of all animals, *e.g.*, cows, buffaloes, goats, contains the same constituents, *viz.*, water, fat, proteins, milk-sugar (lactose), minerals and vitamins, but the proportions of these vary to a considerable extent. Butter-fat is commercially the most valuable and variable single constituent of milk. Dairy chemists in foreign countries have, therefore, paid the greatest attention to study the causes for its variation. They observed that with the increase or decrease in the fat content the other constituents also vary in a characteristic manner. The protein and ash contents increase or decrease along with the fat in milk but sugar behaves in the opposite manner. Proteins show the greatest variability after fat, followed by ash and milk sugar.

The studies made abroad show that the main causes, which affect the composition of milk are breed, individuality, feed, age, stage of lactation, time of milking and interval between milkings. Although complete data showing the effect of the above factors on the composition of cow or buffalo milk in India are not available, the figures at hand

indicate that they are generally applicable in this country also. They are discussed briefly as under:—

#### (1) BREED VARIATIONS.

The variations in the composition of milk of different breeds of Indian cows, buffaloes and goats have already been dealt with in the previous section. These differences are largely genetic but in other countries it is observed that a breed testing 3.4 per cent fat when kept under entirely changed conditions of environment, might show considerable variations in the fat content. In India it often happens that the cows and buffaloes from the North are taken to different parts of the country and even to Burma but no systematic study has been made to determine the differences in the composition of milk produced by them in the breeding tracts and at the distant commercial centres to which they are taken.

#### (2) INDIVIDUAL VARIATIONS.

Although most of the milk producers in India have no facilities for getting the milk of individual animals tested, they know that some cows and buffaloes give richer milk than others. The analysis of the milk of certain individual cows and buffaloes is reproduced below:—

##### *Individual variations in the composition of milk.*

Name of the animal.	Specific gravity at 15°C.	Fat per cent.	Solids-not-fat per cent.
<i>Sindhi cows—</i>			
Kalyanwaty .. .. .	1.0322	5.69	9.03
Hirka .. .. .	1.0324	4.81	8.46
Dukki .. .. .	1.0293	4.66	8.16
<i>Murrah buffaloes—</i>			
Chandrika .. .. .	1.0334	7.05	9.49
Dhan Konwar .. .. .	1.0334	7.38	9.64
Maharajin .. .. .	1.0340	6.57	9.41

Animals in each group were of about the same age, weight and in the same stage of lactation. They were yielding practically similar quantity of milk. The quantity and kind of feed given was also uniform and they all belonged to the Agricultural Institute Dairy, Allahabad. Yet differences in the composition of their milk are quite marked. The bulking of the milk of many cows in the herd will, however, result in the composition being nearer to the average. The larger the number of cows and more thorough the mixing of the milk, the greater will be the uniformity in its composition\*.

\*W. L. Davies—The Chemistry of Milk.

## (3) FEED.

Animals which are regularly given a well balanced ration are better able to maintain constancy in the composition of their milk. Temporary improvement or deterioration in quality may result from changes of feed. The milk yield in such cases goes down but the percentage of fat shows a slight increase which generally returns to normal within a short time.

During summer in India, grazing is poor if not altogether absent, the heat is intense and water scarce. The conditions seriously affect the milk yields. Identical but less severe conditions elsewhere have the tendency to raise the fat and protein contents and decrease the milk-sugar. The high temperature alone, on the other hand, tends to cause a decline in fat but its effect does not equalise the effect of under-feeding. Summer milk is also deficient in vitamins A and B as sufficient green fodder is not available.

## (4) AGE.

The yield as well as the richness (fat content) of milk deteriorates with the age of the animal. No experimental data are available in respect of Indian cattle but the table below gives figures obtained in the United States of America, which are based on a study of over 2 lakh lactational records of different breeds of cows :—

*Influence of the age of cows on the fat content of milk.†*

Age (years)	Fat per cent.	Age (years)	Fat per cent.
2	4.35	11	4.15
3	4.33	12	3.99
4	4.31	13	3.92
5	4.26	14	3.91
6	4.23	15	3.90
7	4.20	16	3.90
8	4.19	17	3.94
9	4.18	18	3.30
10	4.16	..	..

The figures show that the fat content progressively decreases with the age of the animal. The greatest fall occurs in breeds secreting milk of **high** fat content.

†Factors affecting the composition of milk—C. W. Turner.

## (5) STAGE OF LACTATION.

For the first three months of the lactation the percentage of fat and solids-not-fat decreases\* but the yield increases. With the advance of lactation, the yield gradually goes down and the fat content increases. Once the cow becomes pregnant, the yield of milk declines more rapidly and the fat test improves further. In Northern India such animals are known as *bakhri* equivalent to "stale cows" abroad. Their milk although more rich is not prized as it has generally a salty taste due to abnormal increase in the chloride content.

## (6) TIME OF MILKING.

Animals are generally milked twice a day, the time of milking depending upon the hour at which milk is required by the collectors or consumers. It is observed that the greater the interval between the time of milkings, the larger is the yield and the lesser is the fat content. In India, the village animals are generally milked between 4 and 7 in the morning and between 3 and 6 in the evening. The usual interval between the morning and evening milkings is 10 to 11 hours. Thus morning milk is slightly inferior to evening milk in fat content although the yield is usually greater.

The table below gives the differences in the composition of the morning and evening milk with two herds of Tharparkar and Hariana cows at Karnal (Punjab). The figures represent annual averages for the year 1934-35 :

*Difference in the composition of morning and evening milks.†*

Breed.	Fat per cent.		Solids-not fat per cent.	
	Morning	Evening	Morning	Evening
<i>Tharparkar</i>				
50 cows .. .. .	4.4	4.8	9.14	8.92
<i>Haryana</i>				
40 cows .. .. .	4.4	4.8	9.2	8.96

In the above case the milking hours were 4 A.M. and 2 P.M. If, however, the interval between milking is exactly 12 hours, then due to other factors, *e.g.*, exercise, the morning milk may be slightly richer than the evening milk.

\*W. L. Davies—The Chemistry of Milk.

† Report of the Imperial Dairy Expert, 1934-35.

### D.—Fat globules in Indian milk.

The size, shape and number of the fat globules in milk are of importance in processing as well as long distance transport of fluid milk. Milk having large globules churns more rapidly and when transported over long distances shows signs of partial separation. It also causes considerable variation in quality during distribution if it is done through a can with a delivery tap at the bottom as the fat accumulates in the top layer.

A preliminary micro-photographic study was made at the Dairy Institute, Bangalore, and milk of several breeds of cows and buffaloes was examined\*. It was observed that the size of fat globules in the case of draught breeds of cows was smaller than of those found in milk of dairy breeds. The milk of buffaloes was found to contain fat globules of larger size but comparatively smaller in number.

Two micro-photographs of the milk of Sindhi cows and Murrah buffaloes are given on the opposite page.

### E.—Quality of bazaar milk.

Enquiries all over the country have shown that the extent of adulteration done by the producers is comparatively less than that practised by others in the trade, *e.g.*, by collectors, distributors, etc. Producers generally adulterate only when low prices are paid for the milk or when larger measures are used. They, however, are primarily responsible for initial contamination of milk by paying little or no attention to clean production or proper handling (*see plate between pages 130 and 131*).

Correct handling of milk immediately after milking is of considerable importance to prevent abnormal growth of bacteria and even in countries with much cooler climate than India, special rules are prescribed for this. For instance in the "Milk and Dairies Order of 1926", in England and Wales it is required that,

"Every cow-keeper shall, without any delay other than that caused by any process of straining or centrifugalisation to which it may be subjected, cause the milk to be cooled to a temperature not more than 5°F higher than the temperature of the water supply available for cooling".

It is true that there are certain practical difficulties in carrying out the above under village conditions in India but at farms handling raw milk or at the city stables where ice is readily and cheaply available it would improve the keeping quality considerably if the blood heat of the milk is taken away soon after it is milked.

The conditions under which milk is produced are generally most insanitary. It is common experience of large buyers of village milk, *e.g.*, some of the creameries, to find most unexpected articles coming

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\*Indian Journal of Veterinary Science and Animal Husbandry, March, 1937.

out of the milk cans. Pieces of bones, bread, ropes and wool are common amongst other things. These find their way into milk through children who play about the empty cans kept outside. A little care to examine the cans before pouring in the milk would prevent this from happening. In some areas, collectors and distributors may be present at milking times to see that proper care is taken and that pure milk is supplied to them.

The Military dairy farms had an experience of a different nature. It was reported that—

“However good the dairies are, there is always the danger of adulteration and contamination during delivery either by the deliverymen or by the servants. On investigations of 6 deaths from dysentery among children in one station it was found that gross adulteration of milk had taken place during delivery and it was necessary to detail a Military Policeman to accompany deliverymen on their rounds.

“The danger of allowing the servants to take over dairy supplies has been pointed out to the families and they have been advised to keep milk, butter and cream in the original containers until consumed and to destroy all cartons, butter-paper, bottle caps, etc. to prevent their falling in the hands of unscrupulous persons to whom they are a fruitful source of fraud”.

*Extent of adulteration of bazaar milk.*

Area or place.	No. of Samples examined	No. found adulterated	Extent of adulteration with water					
			Below 10%	Between 10-20%	Between 20-30%	Between 30-40%	Between 40-50%	Above 50%
Punjab ..	414	63	31	14	5	13	..	..
Calcutta ..	99	78	7	34	16	15	4	2
Cochin State ..	22	16	..	4	5	4	..	3
Hyderabad State	291	188	29		55		79	25
Madras City ..	105	41	The samples contained water varying from 5 to 63 per cent.					

The most common adulterant is water followed by skimmed milk. The water added may often be dirty and contaminated. The Public Health Authorities at places may even be aware of such additions. For instance, the Health Officer of Delhi mentioned in his annual report as early as 1934 that “while fording the river (Jumna) the milkmen were adding its water to the milk”.

Cane sugar and flour have also been occasionally found in milk in Bengal and Madras. They are added to foil detection of added water by lactometers. It has been reported from Bombay city, that 34 samples analysed contained boric acid and 7 others boric acid in conjunction with formalin. It may be noted that none of the Food Adulteration Acts permits the use of preservatives in milk.

**F.—Bacterial quality of the market milk and the conditions under which it is handled.**

The number and type of bacteria found in milk are the best index of the conditions in which it is produced, handled or stored. From public health point of view, the above aspect is of considerable importance. A sample of milk may be chemically pure and unadulterated but on account of faulty handling or exposure to contamination it may be grossly objectionable and even dangerous to use from the bacteriological standpoint. In other countries, ever increasing stress is laid on clean production and handling of milk under hygienic conditions. In some of them bacteriological standards are also prescribed for market milk and for milk sold under different grades. Similarly all milk received at the dairies and plants is first tested for its bacterial quality or cleanliness and then for purity.

In India although the defective, filthy and often dangerous methods employed in the production, handling and distribution of milk are generally well known to all including the Public Health Authorities, little or no biological work has been done so far to bring to light the real state of affairs of their effects on public health. Figures of infantile mortality in India, said to be the highest among all countries of the world, are often quoted in the various reports but no study has been made to show how far the unhygienic conditions prevailing in the production and distribution of the most important child's food—milk—are responsible for the heavy toll of death and disease.

Bacteria may originate in milk from the diseased udder or the diseased system of the animal itself. The universal Indian practice of allowing the calf to suckle a little milk before each milking, the practice of milking the animals on the streets for door-to-door delivery, the dirty udder and unwashed flanks of the animals, particularly of the buffaloes which wallow in the mud, the unwashed and contaminated hands of the milker, his dirty clothings and insanitary habits, *e.g.*, coughing, sneezing and blowing the nose with fingers, etc., the diseases, if any, of the milker and others handling the product, the filthy condition of the cattle stable which exposes milk to manurial contamination, the unclean and defective transport arrangements, the practice of putting leaves, paper and straw in milk to prevent spilling from open cans, the warm climate of the country so favourable for rapid growth of bacteria, the ignorance and indifference of persons generally engaged in the milk trade even towards the elementary principles of cleanliness, the insanitary conditions of the open milk shops in streets, the lack of suitable technical and educational facilities to create better



understanding in the people concerned, the addition of dirty water to milk, the lack of adequate control by the health authorities, etc., are only a few of the many sources and causes which unfortunately pollute the supply of market milk in India and help to keep its standard low compared to other countries. The plates and their captions opposite pages 130-131 graphically illustrate some of the above objectionable features of the milk trade.

Under a scheme financed by the Indian Council of Agricultural Research, some bacteriological studies of the milk produced round about Lucknow and brought for consumption thereto were made during 1944-47. Besides taking samples from "milk collectors", trained "milk testers" were sent to collect samples from the producing villages. A statement showing the results of the investigation is given below:—

*Results of bacteriological examination of milk collected round about Lucknow.*

Number and the nature of the samples.	Plate count per ml.	Coliform Test		Methylene blue Reductase test (Decolourisation in minutes).
		Dilution 1 : 10	Dilution 1 : 100	
(i) 70 Samples of milk from "collectors".	1.23 to 3.7 million.	+ in all samples.	+ in all samples.	17 to 58 minutes.
(ii) 68 samples of cow milk brought by "milk testers" from producing areas	0.18 to 0.61 million.	+ in 44 per cent of the samples.	+ in 41 per cent of the samples.	90 to 300 minutes.
(iii) 76 samples of buffalo milk brought by "milk testers" from producing areas 15 miles away.	0.12 to 0.63 million.	+ in 51 per cent of the samples.	+ in 37 per cent of the samples.	120 to 354 minutes.
(iv) 58 samples brought by "milk testers" from producing areas over 15 miles.	0.43 to 1.38 million.	+ in all samples.	+ in 35 per cent of the samples.	65 to 145 minutes.
(v) 47 samples brought by "Milk testers" over 30 miles from Lucknow.	0.08 to 0.56 million.	+ in 30 per cent of the samples.	+ in 5 per cent of the samples.	185 to 365 minutes.

The important conclusion to be drawn from the above studies is that while the milk produced in the villages is fairly "clean", it gets contaminated at hands of the "collectors". Villages more than 30 miles from Lucknow produce excellent milk. The collectors adulterate the milk; the water used is not clean but taken from ponds, etc., the suspended impurities in the water aiding in keeping the specific gravity of the adulterated milk high.

Some studies of the farm-produced milk were made at the Indian Dairy Institute, Bangalore, during 1936-37 with a view to exercise day-to-day control on the bacterial quality of the milk. The study

indicated that khaki liveries worn by the milk-men were a source of much contamination due to the difficulty of noticing dirt on them. The use of white uniform effected considerable improvement. Some of the old milking pails and churns which apparently looked clean after washing were harbouring dirt and bacteria. These were replaced with new and easily cleanable ones. The practice of using bottles stored for 3 to 4 hours after sterilization was abandoned and the system of using freshly sterilized and cooled bottles was adopted. Instead of wooden drain boards and churn stands, equipment made of iron, which could be cleaned more effectively was introduced. Certain changes in the milk heater and cooler had also to be carried out to reduce the bacterial count. It is reported that by introducing these changes the number of bacteria in milk was considerably reduced.

The average number of bacteria found per ml. of milk at different stages of handling at the Bangalore Institute Farm are given in the diagram opposite this page. From this it is observed that the maximum number of 225,000 per ml. was found in bulked milk before pasteurisation within about 3 hours of milking. The processing reduced the number to 9,400 ml. but bottling again increased it to 15,000 per ml. Thereafter, the milk was held in cold store for about 11 hours (6 P.M. to 5 A.M.) at 40° to 50°F. It is not known what the count was when milk was actually delivered to the customers between 5 A.M. and 9 A.M., but the examination of the milk returned by the delivery men showed that it contained 121,000 microbes per ml. The increase was evidently due to the rise in temperature which is reported to have been 85° to 95°F. and the lapse of about 14 hours between bottling and the return of the unsold milk by the delivery men.

Even without having a series of comparative figures from other farms, the above study is of enormous value to show that under farm conditions it is possible to produce quite clean milk. It also shows how considerably the process of pasteurisation reduces the count, makes the milk safe and lengthens its saleable life.

#### G.—Milk legislation.

The legal control on the production, handling and sale of milk falls under two main sections. These respectively relate to the prescribing of rules, bye-laws and regulations in respect of (a) maintenance of milch cattle, handling of milk and licensing of premises and men engaged in the milk trade in urban areas from the health and sanitary view points and (b) the prevention of adulteration of market milk through checking and chemical analysis. The former comes within the scope of the various Municipal Acts and for the latter special legislation commonly called the Food Adulteration Acts have been enacted in all the provinces and in some of the acceding States. Under the combined provisions of these Acts there is considerable scope for the local bodies, e.g. municipalities, district boards, etc., to control effectively the production and sale of milk in their areas. It may be mentioned

here that the power of making the necessary rules and regulations and of prescribing legal standards for various food stuffs including milk has always remained in the hands of local Governments and not with the Central Government.

#### (1) MUNICIPAL ACTS AND THE BYE-LAWS UNDER THEM.

Every province and the three corporations of Calcutta, Bombay and Madras have Municipal Acts of their own. In these Acts there are provisions for seizure of "unwholesome articles of food (including at times adulterated food)" and for penalising those who feed "animals kept for dairy purpose on filthy or deleterious substances". The Acts provide penalties for breach of rules made under them. For the first offence it is a fine extending up to Rs. 50 ; for habitual offenders there is a provision for imposing a fine up to Rs. 5 per day from the day of first conviction to the time the breach is discontinued.

For the guidance of local bodies certain model rules, bye-laws and regulations have also been framed and given as addendum in the Municipal Acts. So far as milk is concerned there are bye-laws relating to the construction and maintenance of cattle sheds, milk-shops, and cleanliness of milk stores, milk vessels, etc. Nothing is known regarding the genesis of the model bye-laws. Although it is useful to lay down ideals, the various directions and standards prescribed in the model bye-laws are impracticable under conditions obtaining in India and cannot be satisfied. Bye-laws and rules that are framed should be such as would meet local requirements and should be capable of being enforced in practice. It would be desirable to review these model bye-laws and rules and re-draft them to conform to conditions obtaining in the Indian Union with special reference to the machinery that is locally available for enforcement.

#### (2) SALIENT FEATURES OF THE FOOD ADULTERATION ACTS.

All the Food Adulteration Acts are drafted on more or less a common pattern and in some cases most of the clauses are identical. There is, however, one fundamental difference between the Punjab Pure Food Act, 1929, which has also been extended in the form of Food Rules to Ajmer-Merwara, and Delhi and the Food Adulteration Acts of the other provinces. In the Rules under the former, fixed legal standards for fat and solid-not-fat are prescribed and any sample that falls below these is considered as adulterated. In all other Acts, practically the same standards as are given in the Punjab Act are prescribed, but it is clearly mentioned that if a sample of milk falls below the standards it shall be presumed to be adulterated until the contrary is proved. These are two different aspects altogether and are discussed in a later section.

Besides milk and milk products, the Acts cover a variety of other foods, the most common being oil, *ata* and tea. The term "food" includes every article used for food or drink by human beings, other than drugs or water. The term "adulterated" means that a food has

been mixed or packed with any other substance or any part of it has been abstracted, so as to affect injuriously its quality, substance or nature. The main provisions of the Food Adulteration Acts are summarised below :—

- (i) to provide legal definitions and prescribe the minimum standards of purity for the various foods,
- (ii) to provide or approve the appointment of public analysts for analysing food samples and for giving the necessary certificates for legal purposes,
- (iii) to authorise suitable persons, generally in the employ of local authorities, as food inspectors for taking (purchasing) food samples for legal purposes,
- (iv) to provide facilities to the consumers by arranging to collect food samples as required by any member of the public. The person concerned is, however, required to pay the fees charged, which are generally Rs. 4 to Rs. 15 per sample of milk. The charge is refundable if the sample proves to be adulterated,
- (v) to prohibit handling or sale of food in unsuitable containers and prescribe rules regarding appropriate marking of the containers in respect of any article of food,
- (vi) to demand the maintenance of proper account in respect of the receipt and sale of certain foods, *e.g.*, vanaspati.
- (vii) to provide for the defence of the traders, who can prove to the satisfaction of the law court, that the sample in question was not adulterated by them and they merely sold it in the state they received,
- (viii) to permit seizure of food by authorised inspectors believed to be adulterated or unwholesome and its destruction after the approval of a magistrate.
- (ix) to prescribe conditions for the sale of food, made with cheaper ingredients, *e.g.*, the display of special signboards to show that food made from vanaspati and not ghee is sold at the particular shop,
- (x) to prescribe penalties for infringement of the various sections of the Act and to make rules for the disposal of the fine. The fines are generally classified into two heads, (a) the maximum amount which may be imposed for the first offence, and (b) the fine or imprisonment or both for the second or subsequent offences. Under the first head the maximum amount in most cases extends up to Rs. 200 ; under the second head it extends up to Rs. 1,000 or imprisonment for 6 months or both. The fine including the expenses incurred on analysis of the sample, when realised from the offender, are credited to the local authorities concerned,

(xi) to prescribe a time limit, generally, 30 days, from the time of sampling, within which time summons must be issued to the party who has committed the offence under the Act, and,

(xii) to prescribe the class of magistrates, generally not lower than second class, who should try the cases under the Act,

(3) **EXISTING LEGAL DEFINITION OF FRESH MILK AND THE MINIMUM STANDARD OF PURITY.**

(a) *Legal definitions.*—There is lack of uniformity in regard to the legal definition of milk, which may be either in the Act or in the Rules. In the case of Madras, Assam, Orissa and Travancore and Mysore, the legal definitions appear in the Acts. In the case of all other provinces they appear in the Rules made under the Acts.

Under the Bombay Rules, milk means the normal, clean and fresh secretion drawn from the udder of the healthy cow or buffalo and includes the mixtures of milk of the above animals. In Bengal, it is defined as the normal, clean and fresh secretion obtained by completely milking the udder of the healthy cow and buffalo, properly fed and kept, and has a specific gravity of 1.028 to 1.030 at 15.5°C. and shall contain 4.4 per cent. lactose. In the Punjab, milk is defined as secretion obtained by milking the udder of a cow, buffalo or goat. In the Madras, Orissa and Travancore, milk means the normal, clean secretion drawn from the udder of a healthy cow or she-buffalo either completely or after the first portion has been drawn off to completion.

In the above definitions, none of the provinces, except the Punjab, take into account goat milk. They also do not take into account processed milk, such as boiled or pasteurised milk. Strictly speaking, the Act in all cases is, therefore, applicable to only raw milk and in most cases to cow or buffalo milk only.

The Expert Committee appointed by the Central Advisory Board of Health in 1939 to report upon the existing food standards has recommended the following definition of milk for legal purposes :—

“Milk is the normal, clean and fresh secretion obtained by complete milking of the udder of the healthy cow or buffalo or both during the period following at least 72 hours after calving or until colostrum free, whether such secretion has been processed or not.”

The definitions for skimmed milk are provided in the Rules under the respective Acts only in the United Provinces, Bombay and the Central Provinces. In Kashmir, under a notification, its sales are prohibited except from shops which display proper signboards regarding it. The legal definition of skimmed milk in the three provinces noted above is that it is the milk from which all or part of the milk fat has been removed by mechanical or any other process and includes separated milk or machine skimmed milk.

(b) *Standards of purity.*—As already mentioned, in the Punjab, Delhi and Ajmer-Merwara, there is no such provision for presumption and the standards are fixed legal limits.

The standards prescribed in the various provinces are given in the following table :

*Standards for fresh milk under the Food Adulteration Acts.*

Province.	Minimum percentage of milk fat.	Minimum percentage of solids-not-fat.	Minimum percentage of lactose.	Specific gravity at 15.5°C.
1	2	3	4	5
<i>Cow's milk—</i>				
Ajmer-Merwara ..	3.5	8.0	..	..
Punjab, United Provinces, Bihar, Bengal, Assam, Bombay, Baroda city and Hyderabad.	3.5	8.5	4.0 (United Provinces). 4.4 (Bengal)	1.028 to 1.030 in United Provinces and Bengal. Not less than 1.028 in Assam.
Central Provinces, Madras* Mysore and Cochin*.	3.0	8.5	..	..
<i>Buffalo milk—</i>				
Madras*, Mysore* and Cochin*.	4.5	9.0	..	..
Punjab, United Provinces, Ajmer-Merwara & Delhi.	5.0	9.0	4.0 (United Provinces).	1.028 to 1.030 in United Provinces.
Central Provinces ..	5.0	8.5	..	..
Bihar, Bengal, Assam, Bombay, Baroda city and Hyderabad.	6.0	9.0	4.4 (Bengal)	1.028 to 1.030 in Bengal. Not less than 1.028 in Assam.
<i>Mixed milk—</i>				
Delhi, Ajmer-Merwara and Central Provinces.	3.5	..	4.0	..
Punjab ..	3.5	8.6 to 9.0	..	..
Bihar ..	5.0	9.0	4.0	..
<i>Skimmed milk.—</i>				
United Provinces and Bombay.	..	8.7	..	..
Central Provinces ..	..	8.5	..	..

\*In Madras, Cochin and Mysore, cow milk should have minimum of 0.5 per cent and buffalo milk 0.53 per cent of nitrogen. Both the milks should not have more than 5 parts of sediment per 100,000 parts of milk on 24 hours standing.

It is observed that there are generally three standards *viz.*, of cow, buffalo and mixed milk. Generally speaking, there is not much variation between the provincial standards for each type of milk, but the basis on which these were originally fixed is not known.

It is reported that the existence of three standards in market milk is causing some amount of confusion in the proper administration of the Food Adulteration Acts. The milkmen at the time of giving samples for legal purposes, declare adulterated buffalo milk as cow milk and thus avoid prosecution. This is easily done as the cow milk standard has a lower limit for fat content. There is one other important aspect with regard to milk standards. It is that milk in its natural form as given by the animal is always considered pure. Since market milk is expected to be nothing more or less than natural milk, the legal standards for fat and solids-not-fat should be in close conformity with the averages found in the milk of different breeds. A comparison of the existing standards with the data given on pages 124 to 128 would show that this is not the position. It would appear that the legal standards are uniformly and considerably low and give enough scope for legalised adulteration with water or skimmed milk or both. The natural fat is not less than 4.5 per cent. in the milk of any of the cow breeds, but the standards demand only 3.5 per cent. and in two provinces 3 per cent. only. In the case of buffaloes, it is common to have 6 to 7.5 per cent. fat in the milk of most of the breeds, particularly in Northern India where the legal standard for this milk demands only 5 per cent. fat. In the case of Madras, Mysore and Cochin, the buffalo milk may have 4.5 per cent. fat only for it to be called pure. The figures shown in the table on page 124 are not for individual animals but pertain to the herds and are based on annual averages. This position means that an honest dairyman has unnecessarily to give away 2 or even 3 per cent. fat, it being excess over the standard and yet under the existing legal definition he cannot rightfully abstract it from the milk before sale.

With regard to the standard for mixed milk, there are several discrepancies. Delhi, Ajmer-Merwara and the Central Provinces have prescribed 3.5 per cent. fat and 4 per cent. lactose only without any lower as well as higher limits for solids-not-fat, they being 8.6 to 9 standard for the solids-not-fat contents. The Punjab has prescribed per cent. The corresponding fat standard is 3.5 per cent. Bihar has prescribed 5 per cent. fat, and 9 per cent. solids-not-fat which appear to be more reasonable.

#### (4) EXISTING LEGAL STANDARDS FOR TINNED MILK AND RULES FOR MARKING THEIR CONTAINERS.

Only three provinces, the Punjab, Bombay and the United Provinces have prescribed standards and other regulations for tinned milk, *e.g.*, condensed and evaporated milk. As has already been pointed out in the earlier pages of the report, these are exclusively imported products. They can, however, be reconstituted and used in the same way as genuine milk.

(a) *Legal definitions.*—"Condensed full cream milk" means milk which has been concentrated by removal of the part of its water with or without the addition of sugar, and includes the article commonly known as "evaporated milk", but does not include the article commonly known as "dried milk" or "milk powder".

"Condensed skimmed milk" means skimmed milk which has been concentrated by removal of part of its water with or without the addition of sugar.

"Dried milk" or "milk powder" means milk which has been concentrated to the form of a powder or solid by the removal of water.

(b) *Legal standards.*—The standards prescribed in the three provinces are tabulated as under :

*Standards for tinned milk under the Food Adulteration Acts.*

Type.	Provinces prescribing the standards.	Standards	
		Minimum percentage of milk fat.	Minimum percentage of milk solids-not-fat.
1. Condensed full cream milk, sweetened or unsweetened.	United Provinces, Bombay and the Punjab.	9.0	22.0
2. Condensed skimmed milk, unsweetened.	United Provinces and the Punjab.	..	20.0
3. Condensed skimmed milk sweetened.	Do.	..	26.0
4. Full cream, dried milk.	Bombay	26.0	..

(c) *Rules for the sale of tinned milk.*—In the three provinces mentioned above there are special and rather comprehensive rules regarding the sale of tinned milk. In the United Provinces they are known as the Public Health (Condensed Milk) Rules, 1930:

The essence of these Rules is that the tins of condensed milk or of dried milk must be marked in a particular manner which is generally indicated in a schedule attached to the Rules. In case of condensed skimmed milk a specific warning "Unfit for babies" in capital letters not less than  $\frac{1}{8}$  inch high should appear in the middle of the label surrounded by a bold line. Further, the label of each tin must contain directions, in a particular size of letters, for reconstituting it into standard milk indicating the number of parts of water which should be added by volume to 1 part of condensed milk. These directions also should be enclosed in a panel with a bold surrounding line. In case



of the milk containing added sugar, the word "sweetened" should be added to the direction. If any substance, which is a constituent of milk is added to or abstracted from it, the word "modified" should appear on the label and if any other substance is added, the word "compounded" should appear.

In addition to the above particulars, *e.g.*, warnings, directions and declarations, the name and address of the manufacturer, importer or distributor of the product, and its type, *e.g.*, condensed skimmed milk, dried milk or the dried milk preparation, as the case may be, should be clearly marked on each label. Generally, since manufacturers have their agents in this country, the rules with regard to marking of the labels are carefully observed by them and the tins do have the required particulars on them.

Some of the manufacturers also mark the tins with a time limit beyond which the contents should not be used. The health authorities are said to be following these by destroying the time-barred tins.

(5) RECENT ATTEMPTS AT ESTABLISHING CO-ORDINATION AMONG DIFFERENT UNITS (PROVINCES) IN RESPECT OF FOOD STANDARDS.

At its first meeting held in June 1937, the Central Advisory Board of Health, Government of India, appointed a Committee to investigate the whole question of food adulteration in India, with particular reference to legislation then in force in the different provinces and to the varying standards which were in force. These variations in standards were interfering with the trade between the provinces. The Committee divided the subject into three parts :

(1) the technical aspect comprising—

(a) standards for purity in regard to different food-stuffs,

(b) the standardisation of technique employed in food analysis ;

(2) the legislative aspect including the examination of the various Acts and Regulations in the provinces and the making of suggestions for their improvement in order to make the law more effective ; and

(3) the administrative aspect, including the staff to be employed, methods of sampling, etc.

In their first report devoted to the technical aspects of food adulteration, the Committee recommended a suitable definition\* for cow and

\* It will be observed that the definition did not include goat's milk. The "Central Committee on Food Standards" constituted as per recommendation of the Food Adulteration Committee adopted the following resolution on goat's milk in November 1944,—“with regard to setting up a standard for goat's milk, the Committee considered that in those provinces in which goat's milk was extensively sold to the public, it would be advisable to protect them by including goat's milk in the definition of milk”.

buffalo milk (see page 136). In regard to fat content of cow and buffalo milk it was considered not advisable to recommend an all-India figure. There is practically no inter-provincial trade in fluid milk and the formulation of a common all-India standard was not, therefore, imperative. The provinces were left to decide the figure for themselves. Regarding solids-not-fat, the Committee agreed to the adoption of the existing figures except in Central Provinces and Berar, where they recommended that the S.N.F. for buffalo milk may be increased from 8.5 to 9 per cent. The Committee did not favour separate standards for mixed (cow and buffalo) milk, on account of the varying composition depending upon the proportion of cow and buffalo milk present in the mixture. When dealing with mixed milk, they recommended that the practice adopted by the Madras Government, *viz.*, "when milk is sold without any indication to whether it is derived from cow or buffalo the standard of cow milk shall apply" be applied by the other provinces also.

The following absolute standards were also recommended for condensed milk, dried milk and skimmed milk :—

(i) *Condensed milk.*

	Minimum percent- age of fat.	Minimum percent- age of milk solids including fat.
Condensed milk, full cream		
Sweetened .. .. .	9.0	31.0
Unsweetened .. .. .	9.0	31.0
Condensed milk, Skimmed sweetened .. .. .	..	26.0
Condensed milk, Skimmed unsweetened .. .. .	..	20.0

(ii) *Dried milk.*

	Minimum percent- age of fat.
Dried milk, full cream .. .. .	26.0
Dried milk, three-quarters cream .. .. .	20.0
Dried milk, half cream .. .. .	14.0
Dried milk, one-quarter cream .. .. .	8.0

*(iii). Skimmed milk.*

	Minimum percentage of milk solids other than milk fat.
Skimmed or separated milk .. .. .	8.7
Skimmed milk, reconstituted from skimmed milk powder in accordance with instruction on the label on the container .. .. .	8.7
Butter milk .. .. .	8.7

The legislative and administrative aspects of the problem of food adulteration were subsequently considered by the Committee and Part II of the report containing the recommendations was submitted during 1943. The main features of this report are :—

- (a) the provincial Governments should apply the “ Act ” to any area\* only after it is convinced that the resources of the area in personnel and in funds are adequate to ensure its effective enforcement,
- (b) for each local body a minimum number of monthly samples should be prescribed,
- (c) the technique for sampling should be standardised,
- (d) prosecutions should be launched whenever adulteration has been proved and the offenders, on conviction, should be given deterrent punishment, imprisonment being awarded for a second and subsequent offences,
- (e) stipendiary magistrates not below the second class should try the cases, and,
- (f) cost of the prosecution as well as analysis charges should be recovered from the offenders and a portion of this given to the local body to put it in sufficient funds.

Some recommendations on the creation of a Cadre of Analysts, their qualifications and functions follow. In the existing Acts (provincial as well as self-Government), the Director of Public Health holds only the status of an expert adviser. The Committee recommended that this officer should be statutorily vested with the function of exercising supervision and control over local health administration and the district health officers similarly made responsible for the local executive functions under the Act. Another very important recommendation of the Committee was that instead of legislating only for the control of food adulteration, the provincial Governments should provide an Act

\*In 1940, there were 874 Municipalities and 10,000 local authorities of which 256 of the former and 291 of the latter had made arrangements for enforcing Food Adulteration Act. (Figures exclude Sind and N.W.F.P.; for Bengal and the Punjab, the figures are for the pre-partitioned provinces).

on a wide basis so as to bring together all the existing enactments dealing with food, which are at present scattered in various Acts in its ambit. In this connection, they invited the attention of Provinces to the provisions of Section 103 of the Government of India Act, 1935, under which Provincial legislatures could request the Centre to pass an Act for the control of food production, distribution and sale.

The Committee was of opinion that, while the provision of adequate legal powers was essential for a continuous improvement in the community's food supply, it was also equally necessary to supplement legal measures with administrative action designed to increase the production of essential foodstuffs of a satisfactory quality and quantity. It felt, for example that the cause for the extensive adulteration of milk and ghee was due to the fact that the quantity produced was insufficient to meet the demand. Extension of marketing facilities and education of the public so as to create a demand for improved quality was also stressed by the Committee. The promotion of co-operative effort for larger production of essential foodstuffs and for reducing the cost of their distribution to the public was in the concluding words of the Committee a matter for the serious consideration by provincial Governments.

The improvement of methods of food analysis and the prevention of food adulteration have to be a continuous process. The establishment of co-ordination between Provinces was a matter of vital importance, and the Central Advisory Board of Health appointed a standing committee entitled "The Central Committee on Food Standards" to act in an advisory capacity on the lines of the Society of Public Analysts in England and the British Standards Institution, in 1940.

A Dairy Legislation Committee, appointed by the Indian Council of Agricultural Research has investigated the question of control of the production and distribution of milk and dairy products and has collected valuable information. The bringing of a suitable legislation as recommended by the Central Advisory Board of Health to check food offences is understood to be engaging the attention of the Governments in the Provinces and acceding States of the Indian Union.

## **H.—Standards for market milk in other countries.**

### **(1) CHEMICAL STANDARDS.**

In several countries there are no "fixed legal standards" for milk in the sense that if a sample falls below a certain minimum standard prescribed by legislation it must be considered as adulterated. Formulation of rigid standards for the composition of milk may mean injustice

to the sellers. This is perhaps one of the reasons which promoted some countries to prescribe what are known as "presumptive standards" of purity. The fundamental difference between the two standard is that although in the presumptive standards the minimum limits are fixed for fat and solids-not-fat, if a sample does not comply with the prescribed limits, it is "presumed" in the first instance and not "accepted" to be adulterated. If by a subsequent sample from the cow or the herd or by any other means it could be proved to the satisfaction of the authorities that it fell below the limits due to natural and uncontrollable reasons, no case for adulteration is made out on such a sample. The examination of the milk from the cow or the herd is popularly called "appeal to the cow" and certain rules are prescribed in this connection.

There are no legal standards for milk in England and Wales. The present presumptive standards were prescribed by the Sale of Milk Regulations as early as 1901 and these state that "milk not being sold as skimmed, separated or condensed milk, shall be presumed, until the contrary is proved, not to be genuine if it contains less than:—

(1) 3 per cent. of milk fat,

(2) 8.5 per cent. of milk solids other than milk fat, by reason of the abstraction therefrom of milk fat, solids-not-fat or the addition thereto of water".

The above presumptive standards are still in operation, but it is reported that the interpretation of the phrases "genuine" and "until the contrary is proved" has not always been easy. The real issue is the question of adulteration and not variation in composition.

It is observed, however, that there is a very small difference between the limits prescribed for fat or solids-not-fat contents in the standards—presumptive or fixed—and the average composition of cow milk in the countries where such standards of milk have been prescribed. The standard of 3 per cent. fat and 8.5 per cent. solids-not-fat has been adopted in practically the whole of Europe and many of the States of America, although some of them differ to a small extent. The examination of about a million samples of cow milk from numerous herds in temperate regions (Europe and America) shows the average composition to be 3.7 per cent. fat and 8.8 per cent. solids-not-fat\*. Thus the standards for market milk in the above continents are less by 0.7 per cent. in case of fat and only 0.2 per cent. in the case of solids-not-fat. Actually, however, in countries where the presumptive standards are in force special studies have been made to determine the proportion of genuine but poor quality milk falling below the minimum limits prescribed under

the presumptive standards. The table below deals with the study of the position over a number of years in England and Wales :—

*Percentage of samples of milk falling below the legal limits in England and Wales\**

Number of samples examined.	Percentage of samples falling below 3 per cent fat.	Percentage of samples falling below 8.5 per cent solids-not-fat.	Authority.
676	8.3	24.7	Tocher.
730	8.1	11.6	Cornfield.
127	35.7	10.2	Bailey
104	7.7	9.6	Monier Williams.
6,800	4.9	2.6	Ministry of Agriculture Bulletin.
2,900	3.2	7.8	
(Total) 11,337	(Average) 5.2	(Average) 6.0	

It is understood that a few of these samples may be those sent to the Public Analyst by food inspectors and thus include actually adulterated samples, but the figures are sufficient evidence that a certain proportion of pure natural milk does not come up to the presumptive standards.

(2) BACTERIAL STANDARDS.

Increasing attention is being paid to the bacterial quality of market milk in most countries. Quality control really commences with the cow itself, particularly in the case of tuberculosis. The first attempt to adopt bacterial standards was made in 1900 by the Board of Health, New York. Originally it prescribed a maximum of 1,000,000 bacteria per ml. of milk but later on this was considerably modified. The legal standard for Boston is now 500,000 microbes per ml. Under the Milk (Special Designations) Order, 1923, of England and Wales, the following bacterial standards were prescribed for the different grades of milk.

There are other conditions also which must be satisfied before applying the grade mark.

\* W. L. Davies.—The Chemistry of Milk

*Bacteriological standards for graded milk in England and Wales\*.*

"Grade"	Standard prescribed.	
"Certified"	..	(i) Herd to be tuberculin tested every six months (ii) Maximum microbes to be 20,000 per c.c. and no <i>B. coli</i> in 1/10 c.c. (iii) No treatment by heat permitted.
"Grade A (T.T.)"	..	(i) Herd to be tuberculin tested every six months. (ii) Maximum microbes to be 200,000 per c.c. and no <i>B. Coli</i> in 1/100 c.c. (iii) No treatment by heat permitted.
"Grade A"	..	(i) Herd to be subjected to clinical examination every 3 months. (ii) Same as "Grade A (T.T.)". (iii) No heat to be applied unless a pasteurising licence is obtained in which case this grade becomes "Grade A (Pasteurised)".
Pasteurised"	..	(i) Maximum microbes to be 10,000 per c.c. (ii) No treatment more than once by heat allowed.

The requirements under the grade standards for market milk in England and Wales and their comparison with the quality of milk sold in this country show how unhygienic is our market supply. Bacterial standard by themselves would not solve the problem unless there is proper and effective control of the production, handling and sale of market milk. Before suggesting suitable standards for India, a good deal of study of the conditions and the practicability of effecting improvements is needed and the Health Departments should give increasing attention to the subject if the bacterial quality of milk in their areas is to be improved. Unfortunately at present many provinces and the acceding States do not have a proper bacteriological staff and laboratory where such investigations can be successfully carried out. On that account it would perhaps be desirable to adopt in India the "Methylene blue reductase test" for bacterial counts.

The test has been used in Europe for many years but is now being intensively used by all the dairying countries for determining the bacterial quality of raw milk. Its results are considered reliable and as valuable as those obtained by the method of plate counts.

\* The statutory Rules and Order No. 356 of the 1936 now supersedes the previous regulations and prescribes only two grades for raw milk, viz., "Tuberculin Tested" and 'Accredited' "Pasteurised" grade still exists for processed market milk.

The test is based on the fact that bacteria have the powers of reducing the various dyes, including methylene blue. If, therefore, methylene blue solution is added to milk, the bacteria present react and the blue colour eventually disappears. The greater the number of bacteria in a sample of milk, the more rapid would be the decolourisation. The test is simple, inexpensive and elaborate apparatus and qualified workers are not required. 1 ml. of methylene blue solution of a specific strength is added to 10 ml. of milk. The sample tubes are placed for incubation in a water bath, the temperature of which is maintained at 98° to 100°F.

The following classification is extensively used in the Scandinavian countries and is reported to be working satisfactorily under Canadian conditions also.

*Standard classification for bacterial quality of milk based on the methylene blue reductase test\*.*

Grade	Time taken and the approximate number of bacteria per c.c. of milk.
I. Good .. ..	Not decolourised in 5½ hours, containing as a rule 0.5 million bacteria per c.c.
II. Fair average quality ..	Decolourised in less than 5½ hours but not less than 2 hours containing as a rule 0.5 to 1 million bacteria per c.c.
III. Bad .. ..	Decolourised in less than 2 hours but not less than 20 minutes containing as a rule 4 to 20 million bacteria per c.c.
IV. Very bad .. ..	Decolourised in 20 minutes or less containing as a rule over 20 million bacteria per c.c.

The actual operation of this test under Indian conditions of temperature would have to be tested before prescribing the local standards.

#### **I.—Control of the sale of milk in England and Wales—Comparison with India**

The control on the quality of milk put on the market may be divided into (i) official and (ii) by the trade. The first is by the local bodies and Municipalities operating the Food and Drugs Adulteration Act. The second is the control carried out by the dairies or distributing agencies themselves with a view to ensuring the quality of milk put on the market by them.

##### **(1) OFFICIAL CONTROL.**

The system of milk inspection in England and Wales is radically different from that in India. The milk sampling officers or food inspectors attached to a municipality or a borough are equipped with all facilities

\* Singleton and Hood—Testing of Milk, etc.



of testing samples of milk. They invariably have an intimate knowledge of the business reputation of all persons engaged in the milk trade in their area. This is obviously established not on mere hearsay but on regular inspection of the quality of milk in the market.

On noting a defective sample, the inspectors warn the milk seller in the first instance. They then take further samples to see if the quality has improved. The general procedure is to take first an informal sample. If it is suspected to be adulterated or is found to be of poor quality, a formal sample is then taken. If the latter confirms the previous finding, the sampling officer arranges to take a sample from the source of supply, which may be the farmer or a wholesale dealer. Here also he may take informal and formal samples. Thus before he takes the final sample for sending it to the public analyst for his certificate and action in the matter, 4 samples would have been previously taken and analysed.

This system of continuous and informal sampling of milk by the food inspectors is of considerable assistance in the administration of the Food Adulteration Act as it indicates in the minimum of time, trouble and expense, the stage at which adulteration is taking place. In fact, where a large quantity of milk is handled it is often difficult to lay hands on an elusive offender unless a number of informal samples are continuously examined.

With the municipal bodies in India, the sampling is so irregular and insignificant compared with the trade in milk at any centre, that there could be no question of sanitary inspectors, who are entrusted with the duty of milk sampling, to have any intimate knowledge about the business integrity of the numerous milk dealers or the quality of milk handled by them from day-to-day. Hence, the question of giving warning or creating respect in the mind of the trade against adulteration hardly arises. On the other hand, it sometimes happens that when the milk seller knows that sample for checking is to be taken he avoids giving it by various means. Often he gives incorrect name and address which renders the tracing of the man laborious and difficult. Under certain sections of the Indian Penal Code, there is provision to deal with persons who give wrong names and addresses to the Food Inspectors but the procedure that is laid down is rather cumbersome.

## (2) CONTROL BY THE TRADE.

Dairies with a large daily turn-over of milk pay special attention to ensuring the supply of pure, wholesome milk to their numerous customers. They have their own system of checking and controlling the quality at all stages between the farms and the customers for which proper facilities are provided and a competent staff maintained. The quality control exercised by the trade is often more thorough than that enforced by the official agency. It includes also a check on the running of the processing plant and on various other items which reflect upon the final quality of the milk, chemical, asthetic and bacteriological.

### **J.—Suggestions for improving the quality of market milk in India.**

The foregoing discussion in this chapter illustrates that although the Food Adulteration Acts and other Regulations have been in force in the Provinces and acceding States for many years, they have generally been honoured more in their breach than in observance. If matters are allowed to drift as hitherto there is little hope for better results in the future. Such a state of affairs has done immense harm to the dairy industry. It has permitted the inefficient and dishonest milkman to carry on with impunity his business of cheating the public and of supplying them with dirty milk which has probably been the cause of many deaths and diseases, particularly amongst children. On the other hand, it has discouraged to the very extreme, the efforts of the honest dairymen, particularly of private farms and co-operative organisations, in putting wholesome and pure milk and dairy products on the market. In short, the position today is that neither the trade, the public health authorities nor the consumers are satisfied with the existing conditions of the milk supply.

In the next chapter the administrative measures taken in different areas for improving the supply as well as quality of the milk in urban areas, is considered. By adopting wherever practicable the suggestions given below some general improvement in the milk supply of the country can be immediately effected. These are commended for the attention of the Public Health authorities and the milk trade :

- (a) removal of milch cattle from congested stables in cities to rural areas where milk can be produced under natural surroundings,
- (b) organised production and distribution of milk through canalising the supply through a few selected agencies instead of its being distributed, through innumerable petty men in the trade,
- (c) enforcement of the provisions of the Food Adulteration Acts,
- (d) inspection of cattle sheds, dairies, milk shops and cream separating stations and enforcing minimum standards of hygiene in their establishment,
- (e) licensing of various persons engaged in the trade, and,
- (f) strict control over the utilisation of skimmed milk powder.

## **CHAPTER VII.—RECENT DEVELOPMENTS IN THE MARKETING OF MILK IN URBAN AREAS.**

### **A.—General background.**

The conditions generally existing in the different branches of the fluid milk trade in the Indian Union have already been discussed in detail in the foregoing pages. It will be noted that more than half of the milk consumed in the urban areas is produced within the cities and towns. The climate coupled with the conditions under which milk is produced bring about rapid souring. Generally, 5 to 6 hours represents the maximum period during which milk can be kept in the raw state. Timely

delivery of milk is of great importance. These limitations explain the reason why large number of milch animals are kept in all cities ; milk produced has to be disposed of immediately without any transport or processing problem arising. Most of these animals are kept under exceedingly congested and filthy conditions. They are fed on purchased fodder, which raises the cost of milk production. The labour charges, stall rent and other expenses are also comparatively high. In the circumstances, animals cannot be fed properly and when dry many of them, still in their prime, are slaughtered. The calves are seldom reared properly ; the majority of them die of starvation and this is a great loss to the nation and the dairy industry. All these factors make the milk costly and scarce. The producer, therefore, resorts to adulteration and sophistication.

With a view to ensuring quality and timely supply, many consumers are forced to maintain cattle in their houses.

In the rural areas which supply the balance of the urban demand and all the rural requirements, one finds a different set of conditions, also not conducive to promote dairying as a lucrative profession. On the one hand, milk production by individuals is a small scale industry and difficulties of collecting it in large quantities are many. On account of these very difficulties and the lack of quick and "safe" transport during all the seasons, the village producer does not find a remunerative outlet for the milk or products. In a majority of the cases, the milk is converted into ghee which pays him the least. Through the efforts of milk collectors and wholesalers, villages within a distance of 4—10 miles (*i.e.*, within reach of a cycle or *tonga* in about 2 hours) from towns and cities have been partially developed for production of milk.

As regards the collection and distribution of milk, a number of malpractices have been noticed. Buyers use larger measures. The producer who has taken a cash advance is largely in the hands of the buyer with regard to the prices he will be credited for milk supplied. That he should seek redress by increasing the quantity by adding water is perhaps a consequence of a contract entered into in bad faith. Adulteration does not end with the producer ; that is merely the beginning of it because at every stage of its journey to the consumer, water is added to the milk. The water used is seldom clean. The result is that the consumers get milk which is bacteriologically unclean and very poor in quality.

The enforcement of the Food Adulteration Acts by Municipalities and Corporations is half-hearted and far from thorough. The existence of these Acts has not deterred the various agencies from selling grossly unclean and adulterated milk in all cities and towns.

In the last analysis, the reason why the fluid milk trade is not developing sufficiently to meet the demand is the poor standard of morality of the middlemen. They have hampered all well-directed attempts to improving the condition of the trade by their unhealthy competition made possible by widespread adulteration. The co-operative organisations, the

dairy farms and other endeavours have failed to achieve their aim under its unsparing depredations. The buyer of milk views both the honest and the dishonest dealer with equal suspicion and takes the cheapest on the assumption that the less he pays for water the better.

The vicious circle is thus complete. The producer in remote villages finds the dairy industry unremunerative and neglects his cattle. It has been indicated that the production of milk could be increased by 20 per cent. through the proper feeding, breeding and management of the cattle already existing in the country. In view of the small scale production of milk in villages, the first step for developing the dairy industry is the grouping of rural producers in suitable areas so as to assemble a fair quantity of milk without difficulty. But the age-old habit of dealing individually in small lots and the obligations to the petty financiers, however, make the task of organising the rural producers voluntarily into milk supply organisations at once difficult and slow.

The dairy industry has remained perforce in the hands of small and unenterprising distributors. In its present state, it is considered a risky investment by capitalists. It is unlikely that it will ever become a capitalistic enterprise. There are, unfortunately, no indications that left to themselves, the petty producers, dealers and others would in future organise the industry on a sound and satisfactory basis.

#### **B.--Review of previous efforts at re-organisation and their achievements.**

##### **(1) BY CO-OPERATIVE ORGANISATIONS.**

The Co-operative Departments in some provinces have striven during the past two or three decades to organise assembling, processing and distribution of village milk on a large scale. The subject is dealt with in detail in a later section of this chapter. It will be seen that most of the societies organised for the purpose had to be heavily subsidised either in the shape of loans and writing off their bad debts or by way of providing managerial staff. Some of these co-operative organizations when they contracted to supply milk to the army were able to increase their business four to five times. The army provided money for advancing loans to producers and supplied trucks for transport. The object lesson provided by the army is that given necessary credit and other facilities and provided there is a similar organised drive, milk production can be rapidly increased. The Co-operative institutions have been and are still being handicapped by the unhealthy competition encountered both in buying and selling the milk.

##### **(2) BY PRIVATE DAIRY FARMS.**

The number of private dairy farms is so limited in the country and the quantity of milk handled by them so little that they cannot claim to be of commercial importance. This is unfortunate. The formation of large number of dairy farms can be of use in effecting improvement in the quality of cattle and supply of milk. But here also it is not only a matter of facing unhealthy competition from the petty producers but the comparatively poor quality of the Indian cow makes dairy farming

an uneconomic proposition till about the fifth year when the farm bred generation of dairy stock start giving milk. As such it forms a serious obstacle to the spreading of dairy farming as a private enterprise.

The progress of dairy farms in the past shows that they have made very little contribution to the general improvement in the milk supply and development of the dairy industry due to their limited number and size. They have, however, maintained a high standard of quality and business integrity and they have also been instrumental in acquiring the much needed practical experience in the large scale production and distribution of milk under Indian conditions.

### (3) BY THE CORPORATION OF BOMBAY.

The Corporation of Bombay have been considering the question of improving the milk supply of their city for the past 20 or 25 years and have examined several schemes in this connection. The negotiations conducted by the Bombay Corporation are of immense value as they bring out the reactions of the trade and capitalists towards initiation of dairy schemes. The salient features of the various schemes examined in the past are as follows :

In 1920 a scheme was prepared for erecting cattle stables at Deonar near Trombay. In this scheme 500 to 600 milch animals were to be maintained on about 300 acres of land and the scheme was estimated to cost Rs. 209 lakhs. It did not, however, materialise as it was considered to touch only the fringe of the problem and it was doubtful if it could reduce the price of milk. Its financial success was also problematical. It was felt that the principal object of the scheme, namely the prevention of premature slaughter of milch cattle could not be attained by it.

While the Trombay scheme was under consideration certain other schemes submitted by private parties for producing milk at Telgaon near Poona for supply to Bombay were also examined. The main features of these schemes were that the proposed dairy company should raise a capital of Rs. 10 lakhs of which the Corporation should contribute a fifth or Rs. 2 lakhs. The Corporation was required to guarantee a return of  $5\frac{1}{2}$  per cent. for 10 years on the capital invested. The proposal received favourable consideration and it was decided that more schemes, of similar nature should be invited by advertisement before taking further action. Advertisements were accordingly put in and three offers were received. These were accepted on the conditions, (i) that the Corporation should contribute a fifth of the authorised capital, (ii) that the company should undertake to supply 300 gallons (about 37 maunds) of milk per day within one year after the payment of the municipal contribution, (iii) that it should have on its Board of Directors two municipal councillors and the Municipal Dairy Expert as *ex-officio* director without a vote, (iv) that the Corporation should have the right to buy up the

concern, the option being exercisable every 10 years, (v) that the Corporation should guarantee for 10 years  $5\frac{1}{2}$  per cent. profit on the capital invested and (vi) that in the event of any sums being paid by the Corporation under the guarantee and of the company subsequently making in a year profit in excess of 10 per cent. of its paid up capital, the excess should be paid to the Corporation.

The above scheme could not, however, materialise as the incurring of expenditure outside the Corporation limits was held *ultra vires* and steps had to be taken first to amend the Municipal Act accordingly. The Act was ultimately amended which took time. It now gives power to the Corporation to incur expenditure outside the city, provided it is sanctioned by a resolution supported by at least 54 councillors.

But even after the above provision was made, work could not be started and the Corporation decided to re-advertise the proposal and invite fresh offers. This time the intention was to help production of dairy farm milk. One offer was considered in this connection. The conditions were that within two months of commencing the work, the dairy company would supply a minimum quantity of 10,000 lb. of milk per day. The milk was to be tested by the Corporation and only that with 6 per cent. fat and 8 per cent. solids-not-fat was to be sold. For milk thus certified the company would receive a subsidy of 1 pice per lb. during the first year only and its aggregate amount would not exceed Rs. 57,000. After the first two months no subsidy would be paid for any month during which the total quantity supplied fell short of 1,00,000 lb. It was also stipulated that if the average minimum of 10,000 lb. per day was not maintained during the second year of the company's existence, it would refund to the Corporation half the amount of the subsidy received in the first year. During the first two years the quality of milk was to be examined and certified by the Corporation at its own cost and thereafter the charges for such an inspection were to be met by the company. It was also agreed that the Corporation would construct a cold store at a cost of Rs. 23,400 at one of the municipal markets and rent it to the dairy company at Rs. 125 per mensem. For one reason or other this company also could not come into existence and matter once again remained at a standstill.

Attempts were again made by the Corporation to invite offers for supplying milk to the city with or without payment of a subsidy and although a few offers were received, none of them were considered suitable. Lastly, the Bombay Co-operative Milk Union submitted a scheme to work on subsidy basis. This scheme envisaged erection of cattle stables on a 200 acre plot of land, four miles north of Kandivli, out of which 185 acres were to be reserved for pasture. The construction of a large reservoir to ensure a copious and regular supply of water was also a part of the scheme. It was proposed to chill the milk at site and transport it to Bombay in motor lorries twice a day for pasteurising it before distribution. The selling price was to be  $4\frac{1}{2}$  annas per seer delivered in sealed bottles. This scheme also could not be started in view of the uncertainty of its success.

The foregoing is a brief history of the unsuccessful efforts made by one of the premier Corporations in the country to solve its milk problem. It is seen that after all these endeavours, matters remained where they were a quarter of a century ago and if anything, the problem became more acute with the growth of the city. To-day about 60,000 milch buffaloes and cows are being maintained within the city limits in conditions which would, perhaps, not be tolerated in other countries and certainly not in a city of the size of Bombay.

**C.—Milk Sub-committee's recommendations and action taken on them.**

The Milk Sub-committee of the Policy Committee on Agriculture, Forestry and Fisheries has made several recommendations suggesting measures for increasing production of milk and for reforms in all branches of the dairy industry. Some of these recommendations have already been referred to in the foregoing pages. For immediately increasing the milk supply of towns or given areas, the Committee has recommended organisation, through Government agency, private enterprise or producers' co-operatives, for the collection of milk in rural areas and transport in lorries or by rail to towns. When the collecting centre is far away, the milk should be processed in a "creamery" established at the collecting centre and the processed milk, in a refrigerated condition should be transported by rail. By restricting the use of milk for purposes other than fluid consumption, by making increased use of milk of goats and sheep and of milk powder and condensed milk manufactured in concentrated areas of production within the country, the Committee felt that some further immediate improvement can be effected in the milk supply of densely populated areas.

For a really satisfactory solution of the urban milk supply problem the Committee has recommended action as under :—

- (a) transfer of milch stock from non-essential to essential areas for milk production,
- (b) utilizing *Gowshalas*,
- (c) stopping premature slaughter of useful animals,
- (d) weaning and artificial feeding of calves,
- (e) supply of adequate quantities of cattle feeds,
- (f) strict quality control; and,
- (g) replacing the numerous agencies concerned in the distribution of milk by a few selected agencies (even to the extent of granting a monopoly); and constitution of a Milk Control Board in each town for safeguarding the interests of consumers, producers and distributors and with powers to control the purchase and sale prices.

The Committee envisage the establishment of large dairy farms in the neighbourhood of towns through Government agency or private enterprise, these farms being stocked with milch animals transferred from

areas where they are plentiful. After such farms have been established and when village milk in sufficient quantities is arriving from co-operative societies or "creameries" in urbo-rural and rural areas respectively, the milk supply of the city would be re-organised zone by zone, gradually replacing the milk supply in each zone by milk imported from rural areas. The *gowalas* dislodged from the cities will be colonised in suitable centres in rural areas which will be developed into dairy colonies with roads, housing arrangements, water supply, transport and an organization for buying the milk from the *gowalas* on the spot. Restrictions on the importation of cattle into towns would be gradually imposed as arrangements are made for the supply of milk from sources other than city stables and facilities have been provided for establishing the dislodged milk producers. And, as long as the present system of milk supply lasts, measures would be adopted for the salvage of the dry milch animals.

For accomplishing the above objects, the Committee was of the opinion that stimulus in the forms of subsidies and technical guidance was required at every stage. It has, therefore, been recommended that every organized attempt at developing the industry through private enterprise should be encouraged by providing land, irrigation facilities, supplying plant and machinery, interest-free loans and an assured price for the milk which may be subsidised, if necessary.

A Dairy Development Adviser was appointed in the Centre in 1944 for advising the Central Government in regard to the policy to be adopted for providing technical help and guidance to the provinces and States in the preparation of dairy development schemes and their implementation. Special Dairy Survey staff has since been entertained in the Central Provinces and Berar, Bombay, West Bengal, Delhi, East Punjab, Madras, Assam and the United Provinces. Information relating to the production, procurement, distribution, quality, prices, etc., of milk and milk products in some of the important milk producing and consuming areas has been collected in all the above provinces through rapid surveys, for the formulation of specific schemes.

Financial assistance is also given by the Centre for the purchase of plant and equipment for the Co-operative Milk Unions already started, or in the course of formation at Lucknow, Banaras, Allahabad, Delhi, Madras, Coorg, Anand and for the ghee producing centre in Jhallar Forest Area. The Central Government have promised financial assistance on a 50 : 50 basis to provinces in connection with expenditure incurred on employment of technical staff, supply of concentrates, transport of milk from rural areas and the establishment of "creameries".

The Government of India have also taken in hand a scheme for the training of a larger number of dairy technicians each year at the Indian Dairy Institute, Bangalore.

The Dairy Development Adviser has prepared nine type scheme for the guidance of Provincial Governments in dairy development work and a comprehensive "Five-year Plan" for bringing about increased



milk production on a rational basis. This plan centres round the "Cultivator-Milk Producer" and aims at improving the dairy industry by improving the cultivator's cow, on co-operative lines. The improvements are to be effected through the operation of eight specific projects viz:—(i) milk-cum-bull production farms (ii) small holder milk production farms (iii) colonisation of dislodged city cattle (iv) artificial insemination of milch cattle (v) cross breeding of inferior milch stock in hilly regions (vi) co-operative milk unions (vii) co-operative rural creameries (ghee) and (viii) increased production of green fodder and silage.

Technical advice and assistance for procuring dairy equipment and cattle are also given by the Dairy Development Adviser to private parties interested in the development of the industry.

#### D.—Co-operative Marketing.

Almost all the milk societies and unions in this country have been organised with the primary object of improving the quality of milk supplied to certain towns and cities. They work on the same broad principles modified to suit local conditions, or according to experience gained from time to time and except for minor differences, have the same bye-laws. The main object for which they are established may be briefly indicated as below :—

- (i) to purchase members' milk for sale to consumers,
- (ii) to take necessary precautions to ensure that the milk is not adulterated in any way,
- (iii) to advance loans on easy terms to members for the purchase and feeding of milch animals. The amount of the loan is recovered in instalments from the price of milk supplied by members,
- (iv) to arrange for veterinary aid for the cattle of their members,
- (v) to keep stud-bulls,
- (vi) to purchase cattle-feed in wholesale for re-sale to members at cost price,
- (vii) to distribute a bonus or dividend to the members from net profits after setting apart 25 per cent. for a reserve fund and another small percentage for a common-good fund.

Under the Co-operative Societies Act of 1912, a society is registered provided there are ten adult persons as its members. Generally a society is formed in one village and is called a unit. It may at times include members from two or three adjoining villages and its membership may be as many as 100. It has already been shown that the daily production of milk per village in India is small and as such individual societies cannot economically function for supplying milk to large towns and cities. These are, therefore, affiliated into unions.

Almost all of them have been established through the efforts of the local Co-operative Departments who even now have to constantly guide and supervise their working. Particulars of the more important co-operative milk organizations are given in Appendix X. It will be observed that the 28 unions (with 549 affiliated societies) and 94 societies functioning (functioning independently) handle in all about 2,350 maunds of milk per day. The largest number of milk co-operatives are in Madras with 22 unions and 64 individual societies accounting for over 1,800 maunds of milk per day. The value of milk annually handled by the co-operative exceeds 1.5 crores of rupees. When compared to the approximate annual value of the milk consumed in urban areas this comes to only about 1.7 per cent.

One reason for the existence of the limited number of milk societies and the small quantities of milk handled by them is the scattered and small scale production. Dealing with individual producers is also not an easy matter particularly in the teeth of severe and unhealthy competition from unscrupulous dealers. It is felt that this difficulty could be overcome, if village collectors, who handle the milk of several producers, could be organised into co-operative bodies. In the Act, there is nothing to prevent the formation of a society of such persons if there are ten members willing to register themselves into one. The experiment is worth trying, for, once the assembling and petty village merchants (collectors) are organized to work co-operatively, necessary arrangements could be made to extend the benefits of co-operation through them to the primary producers. It may be stated that the Radhaswami Educational Institute Dairy, Dayalbagh, Agra, which was founded in 1930, is an association of village milk collectors and has been working satisfactorily.

#### (1) METHOD OF WORKING.

The officials of the co-operative department, when they find after a survey that the producers in a village or a group of villages could be organized with advantage into a society, persuade the producers to form one. For the first few months, the society is not registered but, carries on the business with the help of a nominated committee. The necessary equipment, *e.g.*, cans, measuring vessels, etc., are purchased and the producers fix up one or more central places in the villages for the milking of the cattle. Each producer agrees to supply a certain minimum quantity of milk every day. Both morning and evening, the cattle are marched to the milking centre(s) where one of the members of the managing committee would usually be present to supervise the milking. The milk is bulked and measured (or weighed) into cans which are sealed. Further steps depend upon whether the society itself distributes the milk or supplies it to a milk union. In the former case, the cans containing the milk are taken by the fastest available transport to the consuming centre where the milk is distributed from milk depots or delivered in consumer's houses. As a rule, most of the societies sell the largest portion of the milk at milk depots opened in the residential areas in the towns. If the society is one affiliated to a milk union, which

has a processing plant, the milk cans are handed over, at the milking centres or a nearby appointed spot on a metalled road, to the supervisor of the Union who calls for them with a transport. Other unions which do not have centralised collection, processing and distribution arrangements, generally prescribe areas of the town where the milk from a particular society should be distributed either through milk depots or at consumers' residences. Such "distribution schedules" are framed with a view to avoid unnecessary transport or delay. Arrangements are also always made for taking samples of milk for testing by the dairy expert at the head-quarters of the union. In some cases, e.g., the milk societies affiliated to the Madras Milk Union, arrangements are made for the milking of the cattle under the supervision of the buyer, e.g., Government hospitals. Such an arrangement is made only in the case of milk purchasers with whom the Union has entered into an annual contract.

The co-operatives always are guided and encouraged by the officials of the Co-operative Departments. Many of them have been given the services of a trained supervisor by the Departments whose pay and allowances are met by the Government for the first few years. They are also given interest-free loans to be distributed among the members, at nominal rates of interest, for the purchase of cattle. At the time of making payments for the milk to the members, usually once in a week, deductions are made on an agreed basis towards repayment of the loan and the interest.

## (2) MILK UNIONS.

The working of two milk unions are described below :—

(a) *The Calcutta Co-operative Milk Societies Union Ltd., Calcutta.*—

(i) *Early history and present membership.*—The organisation of co-operative milk societies in Bengal was undertaken by the Co-operative Department in the year 1917. The favourable features were that at that time milk at Calcutta was selling at a high price of Rs. 13 per maund and the middlemen were reported not to be giving a fair price to the producers. Important villages for the supply of milk were situated near suburban railway stations, and this further encouraged the scheme. The first society was organised at village Dadpur, which is said to have supplied only 3 seers of milk a day in the beginning. Through constant efforts of the officials and others the number of societies grew and enabled the registration of the Union in the year 1919. In its early days the Union had to face considerable difficulties in organising the producers on co-operative lines. At present the Union has affiliated to it 139 primary societies and the number of individual members exceeds 9,700. The nearest society is situated 12 miles away from Calcutta, while the farthest is at a distance of 48 miles. It is the largest and one of the oldest co-operative milk organisations in India.

(ii) *Milking, collection, and transport of milk.*—Most of the societies are organised in the villages placed at convenient distances from the railway stations on the East Indian and the Martin Light Railways. Each village or society has milkers and carriers of milk who are paid by the Union. For

a society having 40 to 50 members and supplying about 1 to 1½ maunds milk per day, 3 milkers and 1 carrier are generally provided. The animals are milked at the houses of the members and after measurement the milk is delivered to the carrier. He enters the quantity of milk received in the pass-book of each producer and then takes it to the secretary of the society in the village, who is also paid by the Union. The secretary prepares chalangans and keeps the necessary accounts. The carriers transport the milk on head-loads or on shoulder-slings to the assembling centres where the milk is received by the manager who is paid a commission of 12 annas per maund by the Union. There are 18 such assembling centres located near the Railway stations. The manager makes a combined chalan of milk received from all the villages which also shows their lactometer readings and arranges for its transport to Calcutta. The milk is not booked but is carried by special men employed by the Union as luggage with their 3rd class season tickets. The Martin Light Railway allows with one 3rd class ticket 1 maund 10 seers of milk. But one person can carry any quantity of milk so long as he holds the requisite number of tickets. On the East Indian Railway, however, this is not permissible. There, 2 maunds of milk are allowed per 3rd class ticket but a man must travel with this quantity. In other words, to carry 4 maunds of milk two persons with two 3rd class tickets are required. From the Railway station the milk is taken in trucks belonging to the Union to the dairy.

(iii) *Quality control*.—In the village, at the assembling centres and even at the Union's dairy at Calcutta, the quality of milk is tested by lactometers. It is obvious that this method is not very reliable but it is said that a certain amount of moral effect is obtained even by this test. A certain number of fat tests are also regularly performed at the dairy at Calcutta. When there are complaints regarding the quality, disciplinary action is taken against the members of the staff at fault. It may be mentioned here that the milk is handled throughout by the paid staff of the Union.

(iv) *Processing of milk*.—The dairy of the Union is situated in a congested locality in the heart of the city at 119, Bow Bazar Street. The Union is paying a heavy rent but the place is hardly suitable for a dairy. For first 2 or 3 years, the Union handled raw milk but since then has set up a pasteurising plant. The plant is now old and has outlived its useful life. It is understood that a modern plant will be erected as soon as the machinery which has been ordered is received. It is reported that several customers dislike the flavour of milk supplied by the Union which is stated to be unpleasant. There appear to be two reasons for this. Firstly, there is inadequate control of clean milk production in the villages and in the hygienic handling and transport of raw milk. It is a common practice with the milk trade in Calcutta to put green leaves in open milk vessels to prevent splashing (see plates VII and VIII between 130 and 131). It is noticed that in the case of co-operative milk also in spite of every effort to prevent it, the practice has persisted to some extent. This imparts a tainted flavour

to the milk. The cleaning of cans in the villages also needs greater supervision than at present. Secondly, it is almost certain that offensive off-flavours are picked up by the milk while it is heated and cooled, from the foetid atmosphere in the dairy premises.

(v) *Distribution and sales.*—All milk is distributed through delivery men paid on monthly basis. They are not supplied with liveries. Out of about 115 maunds of milk handled per day, about 25 to 30 maunds are bottled and delivered to nearly a thousand consumers. About 20 maunds are sold in bulk in large cans to the hospitals, etc. The remaining quantity is sold in retail in sealed cans having a delivery tap at the bottom. At some of the municipal markets the Union has its retail depots also.

(vi) *Containers.*—For assembling and transporting milk between villages and the assembling centres, the various societies have 4,000 to 5,000 small locally made cans (20 seers capacity) in use. These cans generally remain in the villages and are cleaned as best as the village conditions allow. For transport between the collecting depots and the Union, a further 3,000 to 4,000 larger cans, some of foreign make, are used. Before the empties are returned to the assembling centres they are washed and sterilized over a steam jet at the dairy.

(vii) *Purchase and sale prices.*—In 1946-47, the prices paid by the Union were Rs. 23 and 35-8-0 per maund to members and non-members respectively. But the societies receive milk from the members at the rate of 100 tolas per seer, whereas they deliver to the Union at 80 tolas per seer. The margin is kept by the societies for meeting the wages of milkers, carriers, etc. The retail price of milk delivered in bottles or loose from cans at Calcutta is the same, namely, 12 annas per seer. The coupon system was introduced once but because there were a few instances of forgery it was abandoned. Its re-introduction is, however, under consideration. All milk is sold either on cash or on monthly bills, provided the value of a month's supply of milk is deposited in advance. But the customers requiring milk in bottles have to abide by certain rules, e.g., pay deposit for the cost of bottles, etc. For larger quantities the prices vary according to the circumstances. For instance, the hospitals are supplied pasteurised milk at concessional rates. The contention is that the hospitals can obtain raw or even boiled milk at the above price and hence they should not pay extra to the Union.

(viii) *Management and financial position.*—The management is vested in a board of directors who are elected at a general meeting of the Union from amongst its members. The chairman of the board is generally a leading personality of Calcutta. The membership of the Union is open to the affiliated societies who are its shareholders. The Union spends a part of its profits on general welfare work, e.g., establishing village schools, sinking of tube wells, etc. It also has arrangements for giving free service of pedigree bulls for the cows of the members. A veterinary inspector is maintained who visits the villages and advises the members in regard to the health and general well-being of their cattle. In the

early stages, the Union took an interest-free loan of Rs. 50,000 from the Calcutta Corporation and has paid it up fully. It has now a reserve of over Rs. 1.13 lakhs and hardly any liabilities. The intention is to acquire a plot of land outside Calcutta and to build a modern dairy with a new pasteurising plant.

(ix) *Difficulty in the way of expending the business.*—Although the Union has existed for the last 30 years, the quantity of milk now handled by it amounts to only 3.8 per cent. of that required daily by the Calcutta fluid milk market. There have been several basic reasons why the Union has not been able to expand its activities as much as the directors or the Co-operative Department would have wished to do.

One peculiar feature is that the Union handles only milk from one type of animal, namely, the cow to the exclusion of the buffalo and this leads to abnormal seasonal variations in supply. It has already been described in the Chapter on "Supply", under seasonal variations, that cows generally calve in the early part of the year and they are in flush during the months of March and April. This results in scarcity of milk in the later part of the year. Thus, the quantity handled by the Union in the months of March and April goes up to 150 to 170 maunds per day, whereas in the month of October, it drops down to 75 to 80 maunds. This would be prevented to a very great extent if buffalo milk was also handled as buffaloes generally calve in the middle of the year and keep up the supply during the latter half. But in the whole of Bengal there are very few buffaloes and there is a general apathy for this type of milk. Thus, due to this inherent difficulty, the Union has to sell away at low market rates 5,000 to 6,000 maunds of raw surplus milk during the flush period every year at the Railway station at Sealdah or at the local milk markets. It cannot afford to restrict acceptance of member's milk on account of the fear of losing them. On the other hand during September to February in order to maintain the sales it has to purchase 5,000 to 6,000 maunds of milk from non-members in the villages or from the local milk markets at a higher price. This causes every year a loss to the Union. It is also observed that during the periods of scarcity when they can obtain higher prices from outsiders, some of the members do not give milk to the Union, which cannot effectively insist upon the members giving their entire production to it or to prevent outsiders from buying from its members. In the circumstances it seems hardly justifiable to organise more societies near Calcutta as the problem of seasonal variation would become still more acute.

(b) *The Madras Co-operative Milk Supply Union Ltd., Madras.*—

(i) *Earlier efforts and subsequent progress.*—Attempts to organise the milk supply of the Madras city on co-operative lines was first made in the year 1912 but they did not produce any tangible results. Subsequent efforts were also unsuccessful and it was only in 1926 that the co-operative scheme became successful. The present Madras Co-operative Milk Union was registered in December, 1927. At present,

the Union has 87 societies and 79 individuals as its members. The quantity of milk handled during the year 1945-46 was 1.16 lakh maunds. All the societies affiliated to the Union, excepting the city societies, are situated on the motorable trunk roads, the farthest being 35 miles away from the dairy depot.

(ii) *Milking and transport.*—The milking of the animals is done by members themselves at a central place in each village under the supervision of a paid agent of the Union. He keeps the accounts as well and arranges for the milk to be taken to the road side where it awaits the motor van of the Union. Each member gives a signed agreement for supplying the minimum and maximum quantity of milk but the maximum may not be his entire production. For transporting milk from villages to the dairy depot and its distribution in the city, the Union possesses 8 motor vans. The vans for collecting village milk leave at 5 in the morning and return at about 10. In the evening they leave at 5 and come back at 9. One van is capable of hauling 30 cans of about 60 lb. capacity each. From the villages the milk is brought to the road-side and is picked up by the van.

(iii) *Processing plant.*—In the year 1937-38, the Union purchased land, built a dairy and office buildings and erected a pasteurising plant at a cost of Rs. 92,000. It is located in a suburb of Madras which has now been added to the Madras Corporation and is built on a well selected open plot of land. The cost was met partly from the loan of Rs. 25,000 taken from the Government at 3 per cent. repayable in 10 years and partly from the "pasteurisation fund" which the Union had created several years back by setting aside a portion of its profits. Pasteurisation was necessary for two reasons, firstly to supply disease-free milk to the public and secondly, to avoid milking at untimely hours which caused great trouble and inconvenience to the members and to their animals. Now it is possible to sell to the consumers morning milk in the evening and evening milk the following morning.

The entire quantity of milk on receipt at the deposit is strained, weighed and tested for specific gravity and temperature. If the specific gravity is below 1.03 at 60°F, the milk is sent back to the village and the cost is debited. It is stated that formerly many cans of milk used to be returned, but lately the number has considerably decreased. 80 to 100 samples are analysed daily for butter fat content and proper records are maintained which are open to inspection.

(iv) *Distribution.*—The Union distributes milk (i) directly to customers, (ii) to the public through depots situated in different localities in the city, (iii) to the public through house delivery system, (iv) to all the State hospitals; and (v) to many institutions and hotels. There are 60 milk depots and approximately 600 customers are served through house-delivery boys numbering 20. The depot sales are between 5 to 8 A.M. and 3 to 6 P.M. In the case of house delivery an additional charge of Rs. 2 per month is recovered from each customer. Bottling of the pasteurised milk has been suspended on account of delivery of getting

bottles. The retailing is done from sealed cans having a tap at the bottom. To check the distribution through depots and house-delivery boys, a special staff consisting of a manager and several house-delivery inspectors is maintained which contacts customers at frequent intervals to ascertain if there are complaints. Surprise check samples are also drawn from the cans while on distribution rounds for verification of the quality of the milk at the dairy.

(v) *Supply of raw milk to hospitals.*—Since 1929-30, the Union has undertaken to supply cow milk to some of the Government hospitals at Madras. It is now supplying all the nine State hospitals. The quantity supplied is 4,200 pounds per day which is 50 per cent. of the total requirements. The hospitals require raw milk which is comparatively cheaper. For this it has been necessary to organise the milk men in the city. The members are required to take their animals to the hospitals where they are milked in the presence of the Union's representative and a hospital's man. If the supply of raw milk from cows milked in the hospitals is insufficient, the Union is now allowed to make good the deficiency with pasteurised milk from the dairy.

(vi) *Purchase and sale prices.*—The purchase price from members is fixed according to ruling prices and there is generally a flat price for the whole year. At present, the price paid to the members is 15 annas per Madras measure in the villages and Rs. 1-1-6 to city producers, i.e., Rs. 18-12-0 and Rs. 21-14-0 per maund respectively. The sale price is Rs. 1-2-0 per Madras measure for State hospitals and Rs. 1-4-0 to the general public.

(vii) *Military supply.*—The Union has played a notable part in the supply of milk to the army during 1944-46. From the beginning of March 1944, the Union was supplying 3,000 lb. of milk per day to the military authorities which was soon raised to 7,500 lb. The army authorities gave liberal assistance to the Union in order to enable it to fulfil the contract. Briefly, these were :—

- (i) an interest-free advance of Rs. 1.7 lakhs for the purchase of milch animals by its members ;
- (ii) a permanent advance of Rs. 37,500 to be set off against milk to be supplied ;
- (iii) a staff of two co-operative sub-registrars, two senior inspectors, one dairy expert and one veterinary assistant surgeon ;
- (iv) loan of 250 milk churns ;
- (v) accommodation for keeping 250 animals belonging to city members in the Garrison Dairy Farm ; and
- (vi) provision of transport facilities.

The army trucks used to go to the villages to collect the raw milk and bring it to the dairy. After pasteurisation the milk was taken delivery of by the army authorities at the dairy itself. The Union was not called upon to incur any expenditure on transport.



(viii) *Management of the Union and distribution of profits.*—The executive powers of the Union are vested in a board of management consisting of 11 members of whom 6 are elected from representatives of societies, 3 from individual members and 2 other persons co-opted by the elected members. They hold office for a period of 3 years. The Society has a paid secretary (a non-official) who looks after the entire work. The final authority in all matters rests with the general body.

The profit in 1945-46 was Rs. 25,020. According to the bye-laws of the Union, 25 per cent. of the declared annual profits are carried to the Reserve Fund and from the remaining, a dividend decided upon by the Board of Management but not exceeding 9 per cent. per annum on the paid-up value of each share is paid to the members. A bonus, at the rate to be fixed by the general body on the recommendation of the Board of Management is also paid on the value of milk supplied by the producers. Such a bonus has been regularly paid since 1932-33, and the rate has varied from 1 pie to 6 pies per rupee. A sum not exceeding 7½ per cent. of the net profits is set apart for a common good fund, which may be utilised for the general education and health of the poor.

The Union also purchases in wholesale concentrated cattle feeds for re-sale to its members at cost price charging only 3 pies per rupee to meet overhead expenses. This activity of the Union has been much appreciated by the members. The Union has opened several distribution centres for the cattle-feed.

(ix) *Difficulties in the way of expanding the business.*—The difficulties described in regard to the Calcutta Union are generally applicable to this Union also. Here again mostly cow milk is obtained but somehow or other the Union has been able to find a market for the surplus. It is often converted into cream and butter although there is some loss in the process. In seasons of scarcity, outside influences tempt the members. Matters in one year (1929) were so bad that due to outside influences the members stopped the supply of milk to the Union for sale to hospitals. This position lasted only for a few weeks but the Union had to pay damages to the hospitals to the extent of Rs. 10,000 for failure of supply.

Transport is one of the major difficulties of the Union. One reason why the Union has agreed to supply raw cow's milk milked in the presence of hospital authorities to the State hospitals is that it would find it impossible to pay for the collection of raw milk from the city societies and transport it to the dairy for pasteurisation and again haul the pasteurised milk to the hospitals.

For the Union to develop its business further, it requires finance. Considering the long number of years it has been working and its large turn-over, its resources should be considered to be meagre. It has been working on low margins and it never earned large profits. By the

great services it is rendering to the public of Madras, it has certainly established a claim for liberal assistance from the Government.

(3) PROGRESS MADE BY SOME OF THE MILK UNIONS DURING THE PAST TEN YEARS.

Due mainly to encouragement by military authorities who gave liberal assistance both in money and personnel, some of the milk unions which had contracted to supply milk to the army made remarkable progress during the War years. In Appendix XI the progressive increase in the membership and the quantity of milk handled by six large milk unions in the country are given. One fact that clearly establishes itself from these figures is that given the urge and the necessary facilities, milk co-operatives can rise to the occasion and increase the available supply of good quality milk very considerably. The types of assistance required are (i) interest-free loans, without stifling restrictions, for distribution to the members for purchase of cattle and cattle-feeds, (ii) grants for purchase of equipment. (iii) services of officials of the Co-operative Department for organization, etc. : these the Government should provide free of charge and (iv) assistance in the transport of milk. In order that the co-operative institutions may boldly go forward in their task of bringing radical changes in the quality of market milk, the Government should indirectly remove the greatest handicap which impedes the progress, viz., unhealthy competition from unscrupulous and dishonest petty dealers. It has already been noticed in a previous chapter that a large proportion of the milk (mostly raw) sold in all the Indian cities and towns is poor in quality and not subjected to effective control. This tends to keep the prices down to a figure at which it does not pay to organise collection, transport and distribution of village milk in towns and cities. Milk handled in bulk or that obtained from distant places has necessarily to be processed. At present its price is high because the co-operative handle only small quantities.

(4) THE OUTLOOK FOR THE FUTURE.

In other countries dairy societies have made more headway than other forms of agricultural co-operation. Besides providing valuable data and experience, the working of the milk co-operatives in the Indian Union—many of them were pioneers—has brought to light several important peculiarities in the milk trade in the country. It is useless to think of dairy schemes which aim at destroying the individualistic aspect of milk production, i.e., the family unit, as a milk producer. The Milk Sub-committee has laid stress on co-operative organization in specialist dairy colonies exclusively devoted to production, collection and marketing of milk as well as in village holdings having a small quantity of surplus milk. The Government should now not only sponsor the organization of co-operative dairy societies, but also assist them financially and with trained personnel for at least a period of five years.

### **E.—Dairy Farms, *Pinjarapoles* and *Gowshalas*.**

The Animal Husbandry Departments in certain provinces are indirectly concerned in effecting increased supplies of milk in urban areas through their cattle and dairy farms organised in the vicinity of large towns. The chief aim in organizing these farms is to improve the quality of the milch cattle by selective breeding, feeding and management. The public are allowed to purchase the surplus milch stock as also to have their animals covered by bulls kept in these farms. Many of the military dairy farms which are surplus to army requirements have been taken over by Provincial Governments with a view to improving the cattle industry in the areas.

In the United Provinces, there are already five dairy farms run by the Animal Husbandry Department which have been devolved from military farms and there is a scheme for organizing five more farms. The milk produced in these farms after meeting the quantity required for feeding calves is distributed in towns in sealed bottles. The **Badrak Farm**, which is 5 miles from Lucknow, is now able to supply about 11 maunds of milk per day.

The recommendation of the Milk Sub-committee regarding how *Pinjarapoles* and *Gowshalas* may be used for improving the performance of the milch cattle and as a source of milk for urban consumption has already been discussed (see page 154). There are about 3,000 *gowshalas* and *pinjarapoles* in the Indian Union and some of them, e.g., the **Sodepur farm** run by the Calcutta *Pinjarapole* Society and the **Kandivli Farm** in neighbourhood of Bombay are large and affluent. The *Pinjarapoles* arrange for the salvage of dry stock from cities, have a programme for improving the quality of local animals by selective breeding and also contribute to the supply of milk in the adjacent town or city. The **Sodepur Farm** also keeps "Boarder cows"—an arrangement whereby a city dweller is able to keep his cow in ideal surroundings in the farm for a lump sum payment every month towards feeding and get the whole of the milk obtained from the cow, morning and evening, delivered in a sealed can at his residence in Calcutta. The Calcutta *Pinjarapole* Society is bringing and distributing 17 maunds of milk every day in the city exclusive of the supply from "boarder cows".

*Gowshala* Development Officers who have been appointed in many provinces actively help the *Gowshalas* both in their breeding programme and in the marketing of the surplus milk.

### **F.—The Bombay Milk Distribution Scheme.**

A bold experiment at solving the complicated milk supply problems of a large industrial city through Government agency, with the aim of gradually but continuously reforming the methods of production, collection and distribution, has been going on in the Bombay city from 1944 onwards. The "Bombay Milk Plan", which has been drawn up and which will take five years from 1947 to come into full operation, is very comprehensive in its outlook and is the first of its kind in this

country. A detailed review of the PLAN and how the various vexing problems in the organization of the milk supply to a large population have been tackled would be of interest to other Provincial Governments and municipal authorities who have similar problems facing them in almost all cities and towns.

#### (1) THE EVOLUTION OF THE PLAN.

The question of supply of wholesome milk in fairly adequate quantities at a reasonable price to the residents in Bombay city has engaged the attention of the Bombay Municipality for the past thirty years. The schemes have been referred to earlier, but none of them materialized. The fundamental defect in all of them was that they were designed to solve only a part of the problem and not in its entirety. They were plans to get extra milk from outside the city without interfering with its production inside the city. Under these conditions it was inevitable that severe competition from city *gowalas* should be faced ; subsidies and owner assistance from the Bombay Corporation were not considered adequate safeguards by the capitalists and the proposals did not fructify.

With the increase of population of Great Bombay to over 25 lakhs on one hand and the difficulties regarding getting sufficient number of milch cattle from outside to replace dry ones and rise in cost of cattle feed, the price of milk in Bombay City, during 1942 started skyrocketing, quality suffered very considerably and milk ceased to be an article in the dietary of the poorer classes. The Bombay Government, thereupon, took steps to solve the milk problem by taking certain "short-term" measures. These may be classified under the following heads:—

- (a) conservation of supply of milch cattle by maintaining imports of she-buffaloes from the Punjab, United Provinces, etc.,
- (b) restricting slaughter of useful cattle ;
- (c) salvaging of dry cattle by opening dry cattle farms at Palghar and Jamner ;
- (d) salvaging calves and allowing them to grow into useful animals in a farm opened at Thana ;
- (e) diversion of milk from non-essential to essential uses ; The use of fluid milk was prohibited in the making of tea, coffee, or for the manufacture of butter and ghee. Catering establishments were permitted to use only reconstituted milk from separated milk powder. Among steps for supplying milk to essential users, the Bombay Government with the co-operation of the Bombay Municipality in the city and the local authorities in the suburban areas of Bandra, Kurla Andheri Ghatkopar Chembu and Jehu inaugurated in 1944, a scheme for the distribution of fresh milk to children up to 10 years and to expectant and nursing mothers. Milk was made available, to "card-holders" at 6 annas per seer which was half the market rate, the Government

meeting the other half and all overhead charges. Daily about 2,200 maunds of milk were distributed from 516 centres to 2,40,000 people in the city and 42,000 in the suburbs ;

- (f) import of milk from outside ; From 15 November 1945, Bombay city started getting fresh milk from Anand in Khaira district. At the outset 15,000 lb. were imported daily ;
- (g) popularisation of the use of separated milk powder by opening retail shops for milk powder ; and
- (h) enforcing a rigid control on the supply, prices and distribution of cattle-feed.

It will be observed that the above short-term measures also did not attempt to interfere in the unscientific methods of milk production in congested stables in Bombay or in the established method of distribution of milk to general consumers by *bhayyas*. Rationalisation of both production and distribution and increasing available supplies in Greater Bombay were left for being tackled as a long-range measure.

The Government of Bombay appointed a committee, in 1944 (popularly called the "Wadia Committee") to make specific recommendations on the steps to be taken for the improvement of the milk supply of the city. Its final report was accepted as a basis for the elaborate five-year "Bombay Milk Plan".

Some features of the milk supply in Greater Bombay may be of the interest in this connection.

There are 1,110\* cattle stables, large and small, spread over in the city and suburbs. The milk trade is in the hands of about 3,000 producers (*gowalas*) who own 58,000 buffaloes and 2,500 cows valued at Rs. 3½ crores. As many as 60 per cent. of the *gowalas* own only 1.6 animals each ; 31 per cent. have units of seven animals each. About 34,000 animals are annually salvaged. There are nearly 10,000 persons engaged in the milk business between production and distribution and in connected trades. The small producers deal through middlemen who reap a rich margin without risk to themselves. The daily supply is about 10,000 maunds of milk in Greater Bombay of which nearly 2,500 maunds are imported from outside. The value of milk consumed annually is estimated at Rs. 8 crores. The *per capita* consumption in Bombay is probably only 3 oz. per day.

The cattle in stables are kept in a most unsatisfactory condition. The stall itself leaves much to be desired. Within the confines of it, the buffalo eats, excretes and produces milk. She grows unhealthy fat and is sold to the butcher before her time. Her calf is left to die of starvation. The milk is contaminated even when it comes out of the unwashed udder : the way in which it is subsequently handled by the

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\* The figures relate to the year 1946.

*gowala* and the *bhayya*, and the type and quantity of water used for adulteration, make it a dangerous instead of a perfect food.

## (2) THE MILK PLAN.

The "Milk Plan" through its short-term and long-term measures has the aim of completely re-orienting the industry. The "Plan" has set a target of 15 lakh pounds of milk per day for distribution in Bombay to be reached by 1952. The reorganization under the "Plan" would be on the following lines :—

- (i) establishment of the requisite numbers of dairy farms at various distances from the city and suburbs, in the form of colonies ;
- (ii) removal of all milch cattle in the city and suburbs to these dairy farms ;
- (iii) processing of milk at central dairies and its rapid transport to the city ;
- (iv) import of milk from surplus rural areas, including arrangements for collection, processing and transport ;
- (v) strict inspection over production of milk and over its handling at all stages ;
- (vi) preparation and sale of "toned" milk.
- (vii) establishment of an organization for distribution of milk ;
- (viii) construction of cold storages, balancing stations and milk depots in the city ;
- (ix) enactment and enforcement of stringent laws for punishing producers and roundsmen who adulterate milk ;
- (x) fixing a fair price for producers as well as consumers ; and
- (xi) the establishment of a Statutory Authority which will regulate and control production, distribution, prices, etc.

When completed, there would have been established, on co-operative lines, dairy farm colonies around Bombay for housing 25,000 heads of cattle, in units of 250 animals in each colony, complete with sanitary milking sheds, calf-pens, grain godowns, hay-store and quarters for attendants and supervisory staff. There would be central dairies for handling milk from 5,000 animals, provided by Government. Government will also provide for each unit of 2,500 animals separate veterinary hospitals and inspection staff. The dairy colonies would be constructed according to standard specifications. Those built by Government will be leased upon reasonable terms to private bodies. One essential condition in the lease will be that rules framed by the competent body (Government or the Milk Board, to be constituted later) shall be observed regarding breeding, rearing, sanitation, quantity and quality of milk, hygiene, etc.

Fresh milk from villages is to be brought by rail to Bombay in increasing quantities. Arrangements would be made for the collection, processing and transport of surplus milk from Ahmedabad, Surat, Broach districts and from districts in the Dacca. The production and collection of raw milk from villages would be arranged through producers' co-operatives. When these arrangements have been made and dairy colonies for 25,000 animals have been established, the keeping of cattle in the city and the suburbs would not be necessary and they would be evacuated through suitable legislation.

The distribution of the milk will be entrusted to a special agency or agencies who would take over from the farms at the colonies, raw or processed milk and arrange for its processing, bulking, transport and distribution under an organised scheme for distribution. The preparation and sale of toned milk will be exclusively done by the Government or an authorised agency to safeguard the quality of the whole milk that is being distributed.

A number of subsidiary projects are also being simultaneously worked in order that a milk distribution scheme for a population of 28 lakhs may proceed smoothly without any breakdown. The "Plan", for instance provides for the starting of a model Government dairy farm at AAREY village with 2 units of 250 cows and 250 buffaloes at a cost of 12 lakhs where the very best type of animals will be kept so as to breed pedigree herds in due course. With proper organization Kaira district is expected to spare 1 lakh pounds of milk per day to Bombay. Instead of collecting the large quantity of milk at a number of small or poorly equipped concerns, it would be advantageous to have a specially erected milk dairy with modern equipment and a rail-siding at Anand. A project costing Rs. 18 lakhs is under consideration for this dairy. The provision of all-weather roads in feeder areas, development of railway sidings for loading transport and unloading of milk, salvage arrangements for dry cattle, rearing of calves, veterinary aid, growing of fodder, distribution of cattle-feed, engineering assistance in the planning and layout of dairy colonies, are all to be taken in hand.

The cost of this gigantic five-year plan is estimated at 4.65 crores of rupees. An abstract of the items of expenditure under the major heads can be seen below :—

	(Rupees in lakhs)
(1) Cost of acquiring 16,000 acres of land at different sites for colonising 25,000 buffaloes at, say, Rs. 600 per acre .. .. .	96
(2) Cost of making roads, providing irrigation facilities, dairy buildings and equipment, veterinary hospital, water pipe lines, reservoirs, etc. .. .	70
(3) Cost of constructing dairy farms for 25,000 milch cattle and an equal number of other young and dry stock, bulls, bullocks, etc., and quarters for about 5,000 attendants .. .. .	250

(4) Cost of constructing the model farm for 500 milch animals .. .. .	8
(5) Purchase of cattle for the model farm .. .. .	4
(6) Purchase of equipment for the model farm .. .. .	2
(7) Net cost of salvage work for 5 years at the rate of Rs. 6 lakhs per year .. .. .	30
(8) Government contribution to the capital of the 10,00,000 lb. Anand project .. .. .	5
Total .. .. .	465

Items (1) and (2) above costing Rs. 166 lakhs would be given as a grant by the Bombay Government for the betterment of this vital industry. The expenditure of 250 lakhs for the construction of dairy farms is expected to yield a return of 3½ per cent partly by charging a nominal rent to the cattle-owners occupying the farms and partly by recovery from the sale price of milk, through the distributors.

The Government of Bombay have made it clear that they do not intend to enter into the milk business. The plan merely aims at giving assistance on the right lines to producers to enable them to do their business on properly regulated basis. They, however, intend to separate (a) the production and (b) the processing, transport and distribution and permit the distribution only through licensed and authorised distributors. The control of quality which has been rather lax in the past, will be rigidly enforced under the new arrangements. The "Plan" does not cover at this stage milk products such as curds, cream, butter, ghee, etc. As the existing legislation does not permit all the aims of the plan from being pushed through, the Government intend to bring in legislation for (i) the removal of cattle from the city and the regulated use of dairy colonies to be established and (ii) the organised distribution and sale of milk in one ward or area at a time, till the entire area of Greater Bombay is covered.

### (3) FIRST YEAR OF THE PLAN (1947-48).

In order to pave the way for the larger milk distribution scheme and as a fore-runner to it, Government have made a beginning from 1st March 1947 to get the milk drawn at the stables under their supervision and after transporting it to the milk centres to distribute it to registered customers again under Government supervision. On 3rd March 1947, the newly started Government Dairy at Worli for toned milk started functioning. Within two months of starting the production and sale of toned milk reached 10,000 lb. Small milk producers in Bombay have been organized into producers' cooperative societies. From 1st May, 1947, eight such societies have been supplying 150 maunds of milk every day to Government. A Government Milk Control Laboratory



capable of handling 1,000 samples per day has started functioning from 8th May, 1947. (See plates facing page 132).

(a) *Supply*.—About 600\* maunds of local milk are collected daily from 44 private stables and 13 milk co-operative societies in the city and the suburban district. The quantity procured from each stable or co-operative society varies according to number of animals in each unit; more milk is generally collected from each stable or society in the morning than in the evening. Approximately 530 maunds of milk are brought every morning from Anand, consigned by Messrs. Polsons Ltd. and Messrs. Anand Milk Products. Messrs Polsons send about a twelfth of the quantity as "toned milk".

About 260 maunds of toned milk are produced every day at the Worli Toned Milk Dairy using locally collected whole milk and skimmed milk powder. Toned milk is made by mixing 100 lb., of whole buffalo milk with a fat content of 6—7 per cent. with 60 pounds of fluid milk reconstituted from skimmed milk powder. The fat content of the original buffalo milk is thereby reduced to about 4 per cent. but the S.N.F. is maintained at 9 per cent.

(b) *Collection and distribution*.—A "milk procurement and distribution schedule" is prepared every month. This is prepared on the basis of trucks—these are given distinguishing numbers—which collect the milk and transport it to distribution centres. As transport is costly the trucks are carefully routed and unnecessary haulage avoided. The quantity of milk to be procured by each truck from stables and the particulars of centres to which quotas are to be distributed, morning and evening, are settled before-hand. Trucks taking milk to centres will reach the stables by 3—30 A.M. and 1—30 P.M. respectively and will reach all centres on their rounds before 6 A.M. and 4 P.M. daily. Trucks collecting whole milk for being converted into toned milk reach the stables at 12-30 A.M. in the morning and 12-30 P.M. in the noon. These transport the milk to the Worli Dairy. From there they start on their distribution rounds with toned milk at 5 A.M. and 3 P.M. daily.

Anand milk comes in insulated vans either by the Gujarat or Kathiawar Mail. Messrs Polsons use two vans and the Anand Milk Products one van. (There are six vans in all constructed by the B.B. & C.I. Railway for milk transport. These vans are heavily insulated and have a gross carrying capacity of 11 tons. Chilled milk in cans at about 40°F. is placed in the vans. Blocks of ice are also loaded in the vans. It has been observed that the temperature remains in the neighbourhood of 40°F. throughout the transport. During the return journey to Anand, sterilised empty milk cans are loaded into the vans along with some blocks of ice. In this way, the interior of the vans is kept at 40°F. throughout). The Railways are carrying the milk at concessional rates. Anand milk is delivered to the Bombay Government according to requirements by Messrs Polsons and Anand Milk Products at their cold storage depots. Messrs Polsons have a cold store at Mazagaon to which

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\* The quantities given in this section refer to March, 1948.

they transport the milk in their own trucks *ex-Bombay Central siding*. Messrs Anand Milk Products have small cold store at Mahaluxmi with a railway siding. The van is shunted to this siding and milk cans are unloaded directly into the cold room. On their arrival at the cold store, the cans are weighed and standardised, *i.e.*, they are all made up to 41½ seers (Polsons) or 39 seers (A.M.P.) by adding or abstracting milk. Milk collected both in the previous morning and in the evening at Anand arrive in the vans. The cans containing the morning milk are separately marked in order that they may be issued out first.

Toned milk from Anand for school feeding is handed over to the Bombay Municipality at Mazagaon Cold Store of Messrs Polsons. The Municipal authorities arrange for parcelling the milk to the different schools, in their own cans. These are of various capacities—from 3 seers to 25 seers—and are labelled and sealed. The label carries the name of the school. These cans are collected and deposited at the respective schools in Municipal trucks before 11 A.M. The milk is distributed free to the children—8 oz. to each undernourished child—at about 12 noon.

(c) *Mode of distribution to the general public.*—220 distribution centres for whole milk and 83 centres for toned milk have been set up all over Greater Bombay. Mostly, these are situated in Municipal schools or other public institutions in order to reduce rent and overhead charges. In some areas, the centres are situated at different places for distribution in the morning and in the evening. The Government supply disinfectants and also pay electric charges. The toned milk centres are all in industrial areas. In the "Procurement and Distribution Schedule" quotas are fixed for each centre for the month. These are determined by inviting demand statements from consumers between the 10th and 20th of every month. Separate quotas are fixed for morning and evening, both for the centre and to individual consumers. Two distinct milk cards are also issued to each consumer. In fixing a consumer's quota, endeavour is made to limit the off-take per card to 1 seer in the morning and 3 seers in the evening. There is a greater demand for milk in the morning than in the evening. Further, while unsold morning milk can be sent to hot-milk shops (see below) there are difficulties of disposing large quantities of evening milk, and consumers are encouraged to indent for larger quantities in the evening. The card holder has to produce the appropriate card and pay cash, when the quantity allotted to him would be measured out into his own vessel. A small extra quantity can also be purchased casually if there is any surplus. After distribution to registered card holders, if there is any surplus left, this will be sold to non-registered consumers. Milk, if any, that remains unsold after 8 A.M. or 6 P.M. is delivered to licensed hot milk shops. In Greater Bombay hot milk can be vended only from such shops. There are 38 such licensed shops at present. These shops have also quotas allotted to them. The milk is sold to them subject to certain stringent conditions.

Besides Government depots, private parties are also allowed to distribute the milk. The mode of supply, supervision over distribution, are all the same as for Government depots, but unsold milk is not taken back for delivery to hot milk shops. The distributor is paid a commission of 12 annas per maund.

Milk Inspectors during their rounds of distribution centres ascertain surpluses in each of the depots as also any extra demand from non-registered consumers in adjoining depots. They arrange for the moving of surplus milk from one centre to another to meet such casual demands.

Toned milk is not distributed on cards. It is sold for cash to whomsoever that present themselves at the toned milk centres. Each individual is, however, given only 1 seer.

Trucks carry the empty cans from the distribution centres to the Worli Dairy where they are washed and sterilized. When going to the collecting points, the trucks carry empty cans: the required number of empties are deposited at the stables, in exchange for cans with milk. Messrs Polsons and Anand Milk Products arrange for washing and sterilizing their own cans used for the transport of Anand milk.

(d) *Quality control*.—Great care is taken to control the quality of milk distributed under the Scheme. A large staff of stable attendants, stable supervisors and inspectors have been appointed to supervise the production and despatch of milk from the stables. Each stable has its complement of stable attendants and stable supervisors. The milk is filtered, measured and the cans when filled are sealed by supervisors. Two 4 oz. samples are taken from each one of the collecting centres. The samples are drawn in the following manner:—

Immediately after milking, the milk is parcelled into 20 seers lots and stirred vigorously with a plunger. Half a seer of milk is then removed to a separate vessel. In this way a bulk sample is prepared by removing half seer of milk from each lot of 20 seers. From this bulk sample after vigorous stirring two samples each of 4 oz. are removed into sample bottles. A drop of formalin is added to the samples as a preservative. The bottles are then closed and sealed. The label carries particulars regarding the name of the stable, the name of the sampling officer, whether morning or evening milk and the date. One sample is handed to the stable proprietor and the other is sent expeditiously to the Milk Control Laboratory.

During the course of transport and distribution, check samples are taken by Circle Inspectors and other responsible officers. The check at all stages of the handling of milk ensures the high quality of the milk which is one of the special features of the Plan.

(e) *Payment for milk*.—The stable milk is paid for on the basis of fat percentages. The samples, on receipt at the Milk Control Labo-

ratory, are immediately analysed for fat and the lactometer reading also taken. "Solids-not-fat" is calculated from these values.

The schedule for payment is given below :—

7 per cent fat and above .. .. .	Rs. 37-8 0 per md.
6.5 to 6.9 per cent .. .. .	Rs. 35-0-0 per md.
6.0 to 6.4 per cent .. .. .	Rs. 32-8-0 per md.
5.5 to 5.9 per cent .. .. .	Rs. 27-8-0 per md.
5.4 per cent and below .. .. .	Rs. 22-8-0 per md.

This works out, on an average, to 15 annas per seer of milk. The Government are distributing whole milk at 14 annas per seer. Toned milk is sold at 8 annas per seer. The price paid to Messrs Polsons and Anand Milk Products for delivery of pasteurised milk at their cold stores is Re. 0-9-6 per seer.

The Milk Laboratory daily handles about 400 samples now, made up of 120 samples from stables, 20 check samples from stables, 200 from individual members of co-operative societies and 100 check samples from distribution centres. The stable proprietors or co-operative societies can challenge the analysis of the Milk Control Laboratory. The control sample given at the time of taking over the milk at the stable can be analysed at the Municipal Laboratory, Haffkine Institute or by the Chemical Examiner to the Government of Bombay, the three laboratories recognised for this purpose. Payment will be made on the basis of results obtained at these laboratories. The following table gives a fair idea of the fat content of milk now distributed under the Government Scheme from results compiled at the Control Laboratory :—

Fat content	Morning	Evening
	(Per cent)	(Per cent)
7 per cent and above .. .. .	82	90
6.5 to 6.9 per cent .. .. .	12.5	3
6.0 to 6.4 per cent .. .. .	3.0	6
Below 6 per cent .. .. .	2.5	1

The quantities of milk purchased and sold from 1st March 1947, when the scheme started functioning to the end of January 1948, may be seen in Appendix No. XII. It will be observed that steady progress has been maintained, the total purchases and sales having more than doubled themselves during the eleven months. The overhead charges per seer of milk (the amount that the Bombay Government actually incur to supply one seer of milk under the scheme) has come down steadily from Re. 0-3-2.21 during March 1947 to Re. 0-1-2.9 in January 1948. This figure is bound to come down further as the quantity handled by the Government increases. When the Plan is in full operation, it is expected that the incidence of overhead charges per seer of milk will be a negligible amount.

## SUMMARY

### Supply.

Cows and she-buffaloes constitute the chief source of milk supply. Goats also contribute a small proportion to the total milk supply. Other animals like sheep, camels and asses are unimportant as producers of milk.

According to the Live-stock Census, 1945, the Indian Union had about 411 lakh cows and 196 lakh she-buffaloes, aged three years and above, kept for breeding or production of milk. Goats of all ages and both sexes numbered 467 lakhs ; of these nearly 82 lakhs or 17.5 per cent. were estimated to be hand-milked.

Generally speaking, some breeds of Indian cattle are good milkers, but the average general milking capacity is poor. Although the Indian Union has got 319 lakhs more of milch cattle than the countries of Europe (except U.S.S.R.), her production of milk only about a fourth of that of Europe.

Of the cows and she-buffaloes, roughly 4 and 6 per cent. respectively are maintained in urban areas for production of milk "on the spot". The remaining animals are kept in villages by rural producers, generally in herds of 2 or 3 animals only. Dairying in the Indian Union is thus a rural cottage industry.

Throughout the country, she-buffaloes are found to yield richer and more milk than cows. Taking into account all milch animals which are three years and above in age, it is estimated that the average annual yield of hand-drawn milk per cow is 413 lb. and per she-buffalo 1,101 lb. It is reckoned that on an average a calf does not suckle more than 300 lb. of milk during a lactation, which generally lasts about 210 days. The average milking goat gives 134 lb. of milk per annum and the kid consumes about 50 lb. These yields are relatively poor when compared with those obtained in foreign countries. But the milk of indigenous cattle is rich in fat, that of buffaloes containing almost double the fat of European or American cows.

It has been found that cattle purchased from villages when properly fed and maintained improve their yield appreciably during the following lactation. It appears clear that by better feeding and management alone of the existing cattle, the production of milk could be considerably increased in the country.

The annual gross production of milk in the Indian Union was estimated as 5,827 lakh maunds. Of this about 1,011 lakh maunds were consumed by the calves and kids directly from their

dams, giving the net production of hand-drawn milk as 4,816 lakh maunds, valued at over Rs. 354 crores. Of the total production, buffalo milk accounted for 54.4 per cent. cow milk 42.8 per cent. and goat milk 2.8 per cent.

Data relating to the annual production of milk in previous years are not available. However, one point is fairly clear, *viz.*, that milk production has not kept pace with the increase in human population. It is also believed that the milking capacity of the Indian cattle has deteriorated rather than improved during recent years.

Due to the incidence of calving, cow milk is abundant from February to April and again from November to December, buffalo milk from October to December and goat milk in May and December. In the months of May, June and July, there is a comparative scarcity of milk throughout the country.

The quantities of milk retained by producers for domestic use vary from one area to another. Taking the Indian Union as a whole, it was estimated that they kept back roughly 886 lakh maunds for their own use; the net supply of hand-drawn milk was thus worked out as 3,930 lakh maunds which was partly marketed as fluid milk and partly as milk products.

The import and export trade of India in dairy products is unimportant when compared with the home production.

### Utilisation and demand

Milk is a highly perishable article and has to be consumed fresh. It can be kept in a sweet condition for a brief period through adequate processing. Speedy assembling, long distance transport and large scale processing being yet undeveloped in the country, the consumption of fluid milk is generally confined to the areas of its production.

Although over 90 per cent. of the human population and roughly 95 per cent. of the milch cattle are located in the villages, the demand (saleable) for milk and its products is mainly urban in character. There is practically no assembling of milk for sale in remote rural villages.

The average daily *per capita* consumption of milk including products in the Indian Union is estimated at 5.45 oz. It varies considerably from tract to tract according to the production of milk and density of population. Saurashtra tops the list with 18.8 oz. per head per day, followed by East Punjab with 16.9 oz. Assam has the lowest consumption, *viz.*, 1.2 oz. There are no data to show the trend of Indian consumption which in other

countries has considerably improved through State aid and better planning of the dairy industry during the last three decades. In the Indian Union, the rate of increase in the number of cattle has not kept pace with that of human population and consequently consumption may be said to be on the decrease.

The consumption of fluid milk decreases during the summer and monsoon and increases during the winter months. The variations depend mainly on local factors. Festivals and fairs also cause temporary but rather marked rise in demand, which is generally met from milk used for making products or from that retained by producers for their own use.

On an average, about 36.2 per cent. of the milk produced is consumed in the fluid form, generally after boiling. 43.3 per cent. is converted into ghee, 9 per cent. into *Dahi* and about 4 per cent. in to *khoa*. Butter and cream account for about 7 per cent. Cow milk is preferred for drinking purposes and buffalo milk for the manufacture of products. In the course of manufacture of ghee, large quantities of butter milk are produced. This is a good nutritious food and is widely consumed by producers themselves.

Feeding experiments conducted on school children confirm the necessity for giving them more milk for better growth and proper maintenance of health. For a vegetarian nation, whose diet is deficient in first-class proteins, the value of taking a sufficient quantity of milk can hardly be over-emphasised. There are several long-range schemes being operated in provinces to bring about increased production of milk. In order, however, that school children, expectant and nursing mothers and labour classes in industrial cities may get milk as a supplementary food, it appears necessary that our country will have to import milk powders for a number of years to come.

#### Prices.

Throughout the world, producers get a lower price for milk sold for manufacturing purposes and the highest one for milk sold for fluid consumption. In the Indian Union, nearly 64 per cent. of the milk produced is converted into milk products by producers themselves before sale and, therefore, the price obtained for the latter is of great importance to producers.

Fortunately, there are no effective substitutes for fluid milk, but in the case of ghee—a product which covers 43.3 per cent. of the production—substitution with edible oils, especially *vanaspati*, is possible and is extensively practised. In order to

maintain a fair level of prices for ghee, all efforts should be made to see that vanaspathi is not sold as ghee.

Although the price of milk is quoted by weight, it is always measured and sold. The unit of quotation varies from place to place and so do the measures. Very often vessels which hold more than the stipulated quantity are employed for measuring the milk sold by producers and smaller ones for retail sale.

Facilities for getting milk from distant producing areas being yet undeveloped, local conditions alone determine the price of milk in different areas. The type of milk (cow, buffalo or goat), the purpose for which it is used, the distance of the producing village from the place of consumption and intensity of demand in relation to supply, are the important factors, which govern the price of milk at a particular place.

Milk is generally cheaper in the Northern and Western India than in other parts. Buffalo milk being richer than other kinds of milk invariably fetches the highest price. In the interior milk prices are lower than in the vicinity of towns. Boiled milk sells at one anna per seer more than raw milk, but pasteurised milk sells at twice the price.

As a rule, urban producers get better prices because their milk is fresher and supply is more regular and timely. In the cities, milk arriving earlier in the morning and evening fetches better prices than that arriving late. Compared with smaller Municipalities, the price of milk in cities is high as the demand is more intense.

Due to the various mal-practices, such as adulteration of whole milk with water, selling of partially skimmed milk as genuine milk, use of short measure in retailing, etc., consumers have almost lost faith in the quality of market milk : they generally prefer to purchase cheaper stuff, which has a depressing effect on the trade as a whole. Some actually get the animals milked in their presence and pay a higher price while others keep their own cattle at considerable inconvenience to themselves.

Collectors and distributors usually enter into contracts with producers for the supply of milk.

In general, wholesale price of milk is highest in summer, average in winter and lowest during the monsoon. Retail prices do not, however, ordinarily undergo any variation except during fairs and festivals.

Milk prices have increased by 200 to 300 per cent. during the last nine years, mainly due to conditions created by the War II.



Disregarding the margin of profit due to adulteration, it appears that, on an average, producers in the Indian Union receive about ten annas of every rupee paid by the consumers. Milk collectors and retailers share the remainder, the proportion depending upon difficulties of collection experienced by the former overhead charges and turnover of the latter.

### Collection, treatment and distribution.

For the bulk of the milk produced and consumed in the villages themselves, no elaborate assembling, treatment or distribution is required. For meeting the urban demand, however, about 900 lakh maunds per annum or 18.7 per cent. of the entire production is assembled and distributed. Only a part of this undergoes processing, mainly in the form of boiling.

The problem of assembling and distribution is rather acute. For instance, production in the country-side takes place on a very small scale in innumerable and scattered holdings, which makes the task of collection difficult. On an average, a village produces only 2 mds. 15 srs. of milk per day and a major portion of it is converted into products or retained for family use by producers, leaving only a small quantity for sale. In the "dairying tracts" and in the vicinity of cities, production is more concentrated but can hardly compare with the output per square mile in other dairying countries of the World. In the Indian Union, the distribution also has to be done in small lots.

As a result the dairy industry in the country has remained in the hands of petty dealers with limited means and narrow outlook. Dishonest competition from them has hampered the growth of dairy farms and other organizations, *e.g.*, producers' co-operatives, which have developed so well in other countries.

The functionaries operating in the trade may be divided into three main groups, (a) producers, (b) wholesalers and (c) retailers. The first includes urban and rural producers and dairy farms, the second collectors and co-operative societies and the third comprises *halwais*, milk-vendors, dairies and producer-retailers.

The shops of *halwais* are important for distributing milk, but are generally insanitary and ill-equipped. Many of the so-called dairies have also no proper premises or equipment.

Animals are hand-milked. Cow, buffalo and goat milks are mixed by producers before sale, unless they are instructed not to do so by purchasers. The hours of distribution are between

6 A.M. and 9 A.M. and 4 P.M. and 6 P.M. Milk is ordinarily carried in open buckets to the houses of consumers. Most dairies employ cans for distribution. A few producers walk their animals to the houses of consumers and milk them under the supervision of the latter.

Consumers invariably boil the milk before use. At present very little milk is processed because pasteurisation and proper distribution make the milk very expensive.

The onus of financing the producers rests on those who buy the milk from them. Distributors advance money to collectors and they in turn finance the producers. Loans are realized by deducting regularly small amounts from the value of milk supplied by the debtor.

### **Transportation.**

As milk is a highly perishable and bulky commodity, it requires speedy, regular and cheap transport. Being a liquid, it needs special containers and careful handling during transport. Our country is a land of distances ; but, facilities for carrying milk are very much lacking with the result that milk produced in the interior cannot be economically brought for use in the cities. This is a great handicap and restricts the sale of fluid milk, which is most paying to the producer.

The major portion of the milk is not transported at all and even in towns and cities about 60 to 70 per cent. of the requirements is produced "on the spot". About 400 lakh maunds of milk moves annually from villages to adjoining urban areas, a distance of 10 to 15 miles. Milk is carried mostly in metallic or earthen vessels of all conceivable shapes and sizes, generally without lids.

The means of transport employed are head-loads, shoulder slings, pack animals, bullock carts, boats and *tongas*. Motor lorries and railways are used only in a few cases. Bicycles being cheap and speedy are quite popular. Revision of freight rates and provision of increased facilities by railways are essential if long-distance transport of milk is to be promoted.

### **Quality of market milk.**

Cows, she-buffaloes and goats are kept in our country for the production of milk. The composition of milk secreted by each of these animals is different, particularly in respect of fat content.

Adulteration of foodstuffs including milk is not uncommon in western countries, but the position is nowhere as bad as in our country. Here, it is impossible to get pure and wholesome milk in the bazaar. Adulteration with water and skimmed milk are most common, but sometimes cane-sugar and wheat flour are mixed to escape detection by the lactometer test. The water used for mixing with milk is often dirty, which makes the milk unwholesome and at times, unsafe.

In all provinces and acceding States there are Acts and rules for ensuring that only clean and pure milk is put on the market. Milk has been defined for legal purposes and standards have been prescribed for the three types of milk, *e.g.*, cow, buffalo and mixed. But these standards differ from province to province. The legal standards are lower than the constants for locally produced pure milk and, therefore, leave room for "legalised" adulteration with water or skimmed milk.

The enforcement of the Food Adulteration Acts has not been satisfactory. During the past 8 years, the Central Advisory Board of Health, Government of India, has endeavoured to narrow down the differences in standards that exist in the provincial Acts and to standardise methods of sampling, analysis etc. This body has also suggested the passing of a comprehensive piece of legislation, preferably by the Central Government for uniformity, to replace the various existing enactments dealing with food now lying scattered in innumerable provincial Acts and Rules.

#### **Recent developments in the marketing of milk in urban areas.**

The question of supply of wholesome milk at reasonable prices to residents of towns and cities has engaged the attention of private dairy farms, Provincial Co-operative Departments and Municipal authorities for the last three decades. In view of the small scale production of milk in villages, the first step in developing the dairy industry is the grouping of rural producers in suitable areas so as to assemble quickly a fair quantity of milk. But the middlemen in the trade by their unhealthy competition foiled all attempts at improving the condition of the urban milk trade.

The Milk Sub-committee of the Policy Committee on Agriculture, Forestry, & Fisheries has recommended (1944) action on the following lines for a satisfactory solution of the urban milk problem : (a) transfer of milch stock from non-essential to essential areas for milk production, (b) organization through Government agency, private enterprise or producers' co-operatives, for the collection of milk in rural areas and its transport in lorries

or by rail to towns, (c) developing *gowshalas* as centres for milk production, (d) stopping premature slaughter of useful animals, (e) weaning and artificial feeding of calves, (f) supply of adequate quantities of cattle feeds and (g) replacing the numerous agencies concerned in the distribution of milk by a few selected agencies (even to the extent of granting a monopoly) ; and constitution of a Milk Control Board in each town with wide powers.

A post of Dairy Development Adviser to the Government of India was created in 1944 with a view to advising Government with regard to the policy to be adopted in developing the dairy industry of the country as a whole and providing technical help and guidance to provinces in the preparation of dairy development projects and their implementation.

### **Co-operative Marketing.**

Co-operative Milk Societies and Unions have been organised with the object of improving the quality of milk supplied to towns and cities. Due to the encouragement given by the Central and Provincial Governments, some good progress has been made during the past 5 years, in the organization of new producers' co-operative milk societies and unions. At present, 28 unions (with 549 affiliated primary societies) and 94 societies (functioning independently) together handle about 2,350 maunds of milk per day. The largest number of milk co-operatives are in the Madras Province with 22 unions and 64 individual societies, accounting for over 1,800 maunds of milk per day.

### **The Bombay Milk Plan.**

A comprehensive five-year Plan has been drawn up by the Government of Bombay for satisfactorily solving the problem of milk supply to the residents of Greater Bombay. The Plan is estimated to cost 4.65 crores. It has a target of 15 lakh pounds of milk per day, to be reached by 1952, which is thrice the quantity now consumed in the Bombay city. When completed, there would have been established, on co-operative lines, dairy farm colonies on modern lines around Bombay, for housing 25,000 milch animals in units of 250 animals in each colony with separate, self-contained dairies for handling milk from each herd of animals. A "creamery" for handling 1 lakh lb. of milk per day is proposed to be established at Anand (266 miles away) and pasteurised milk in refrigerated condition would be transported by rail to Bombay. The distribution of milk would be in the hands of a special agency created for the purpose through suitable legislation.

The Plan was brought into operation on 1st March 1947. The Government has made a start by getting milk drawn at the "stables" under proper supervision and distributing it to registered consumers. 500 maunds of locally produced milk collected from 44 private stables and 13 milk co-operative societies, 530 maunds of pasteurised milk from Anand and 260 maunds of toned were being distributed from 303 milk centres all over Bombay city during March 1948. The Bombay Government is incurring an average expenditure of Re. 9-1-6 on every seer of milk distributed under the scheme.

### CONCLUSIONS AND RECOMMENDATIONS.

Milk is a vitally important food to the population of the Indian Union as the national diet is generally deficient in first class proteins and these could be easily obtained from milk. The importance of the dairy industry should not be judged only by the value of the milk produced. Attention is invited at the outset to the recommendations of the Milk Sub-committee of the Policy Committee on Agriculture, Forestry and Fisheries (*see* pages 154—156) and it is recommended that co-ordinated and sustained action should be continued by the Central and Provincial Governments, as laid down by the expert committee, for increasing the production of milk and for the better utilization and marketing of the milk.

#### Production.

Most of the village cattle are semi-starved and badly managed. Better feeding and management of these cattle are likely to increase the output of milk by at least 20 per cent. Increased use of oil-cakes for cattle feeds, extension of the area under fodder crops and the better conservation of green fodder in the form of ensilage are recommended.

Goats of certain breeds give as much milk as some of the cows, while their initial cost is comparatively small. The Provincial Animal Husbandry Departments should, therefore, pay greater attention to the improvement of the goat breeds and to their introduction in suitable areas.

Roughly sixty per cent. of the milk required in urban areas is produced "on the spot" under most uneconomical and insanitary conditions. On account of extra expenditure which has to be incurred on feeding, labour and other items in cities, many good animals, still in their prime, cannot be maintained economically during the dry period and are consequently sold for

slaughter at the end of their lactation. It is recommended that suitable steps be taken by Provincial Governments and Municipal authorities to encourage the production of milk, under natural conditions in rural areas, through the organization of dairy colonies. Meanwhile, it is recommended that the issue of licences for new stables or for increasing the number of animals in existing ones should be discontinued.

The manufacture of products like condensed milk, milk powders, etc., should be encouraged in suitable areas.

### Consumption.

Efforts to increase production are unlikely to bear fruit if steps are not simultaneously taken to increase consumption and find a market for the extra milk. Even with the existing production, there is need for stimulating the consumption of fluid milk, for not only does the sale of fluid milk yield the highest return to producers, but all the nutritive constituents contained in milk are best assimilated when taken in the fluid form. The benefits of taking more milk should be brought home to consumers. They should be assured of a regular and reasonably priced supply of wholesome and genuine milk.

The educational and public health authorities as well as the parents should take up the question of feeding school children with milk. That children should grow into healthy men and women is a matter of national importance. Till such time that dairy development schemes in the Indian Union have increased production to levels that enable all demands to be met, it is recommended that milk powders be imported for the feeding of children and other "priority consumers," viz., expectant and nursing mothers.

Although the Indian labourer has a regular income, he consumes little milk himself. In other countries, factory workers consume very liberal quantities of milk. Industrialists and railway workshops should consider schemes for providing milk to their labourers. Skimmed milk is particularly recommended for this purpose.

### Price of milk.

At present 43 per cent. of the milk produced in the country is marketed in the form of ghee. The demand and price of ghee, therefore, have an important bearing on the gross returns of the milk producers. Adulteration of ghee and the sale of substitutes like vanaspati should be adequately controlled and checked.

### **Weights and measures.**

The measures at present used in the milk trade are both unsatisfactory and unsuitable. Bombay Province and some of the acceding States have standardised the liquid seer on the basis of water, which is not correct for milk. The question of having separate measure for milk should, therefore, be considered.

### **Transport and containers**

At present, consumption of milk in urban areas is much higher than that in the villages. But if prices were reduced, urban consumption could improve further. To achieve this, cheaper milk from the interior should be brought to the cities. Transport agencies, particularly the railways, should examine this question carefully, for they can help a great deal in this direction by providing special facilities and lowering the freight charges.

Long distance transport of milk cannot be developed without paying sufficient attention to the improvement of containers, i.e., milk cans. At present, suitable and improved types of cans have to be imported, which are rather expensive. The possibilities of manufacturing similar cans in the country should be explored and their production in large numbers taken in hand.

### **Quality control of market milk.**

There is a strong feeling in the country that official control of the quality of market milk has been very lax. Adulterated dirty milk is driving away pure and clean milk from the market. The enforcement of the Food Adulteration Acts rests entirely in the hands of Municipal Authorities. It is, therefore, recommended that as they are directly concerned, they should be more vigilant in the matter of quality control of milk and dairy products. The re-drafting of bye-laws relating to the production and sale of milk and dairy products should be done in such a way that the provisions can be properly enforced. Milk and ghee samples for check purposes should be taken more frequently so that people may have faith in the food inspection made by the officials and feel confident about the quality. Most milk is distributed under filthy condition—enough to create a dislike for milk in the minds of many consumers. The vessels used have no lids on them and dirty straw, green grass and plugs of old newspapers and rags are used instead. The Municipal Authorities should take severe notice of such practices and see that these are discontinued.

### **Collection, treatment and distribution.**

Only a small portion of production is subjected to organised collection, treatment—mostly boiling of milk—and distribution.

mainly to meet urban requirements. There are generally done on a small scale and in an unsatisfactory manner by numerous persons. To improve the fluid milk trade, the small and inefficient processor and distributor must be gradually eliminated. Processing and distribution in cities and towns must be entrusted to large well-managed organisations, which can put on the market a high quality product without unduly increasing the cost. Through such a system, the problems of production and assembling can also be solved.

### **Statistics and Research.**

There are several distinct breeds of cows, she-buffaloes and goats. But data—far from complete—are available in respect of the composition of milk of only a dozen of these breeds. These relate invariably to farm animals maintained under special and consequently unrepresentative conditions. More representative data should, therefore, be collected which would act as a guide to public analysts and the trade in general.

In certain respects a bacteriological study of market milk is more important than chemical study, because dirty milk may cause greater harm than adulterated milk. But at present, practically no data are available on the subject. Attention should, therefore, be paid to bacteriological research and this may ultimately lead to the setting up of bacterial standards for market milk—so important in a tropical country like the India Union.

### **Finance and facilities for rearing young-stock cheaply.**

At present, the arrangements for the above are poor. It is indicated that cheap financial credit is necessary during the period when the cattle are dry, so that the producers may be able to feed them properly. There is also the need for the formation of co-operative societies for rearing of female young-stock. These should be situated in areas where grazing is plentiful. The societies should take over the young-stock from the producers to return them after proper rearing, when they are due to calve.



## APPENDIX I

*Number of milch cows and production of cow milk.*

Name of unit.	Animals 3-years and above kept for milk production. (Lakhs)		Approximate annual yield per cow (lb.)	Annual production in lakh maunds.		Percentage to total cow milk production.	
	1940	1945		1940	1945	1940	1945
<b>Provinces :</b>							
Assam .. ..	13.95	11.72	140	23.73	19.94	1.2	1.0
Bihar .. ..	29.14	29.56	620	219.50	222.71	10.9	10.8
Bombay .. ..	22.27	22.31	140	45.55	48.74	2.3	2.4
C. P. and Berar ..	42.07	43.41	65	37.03	37.88	1.8	1.9
Delhi .. ..	0.25	0.28	1,270	3.90	4.38	0.2	0.2
East Punjab ..	10.27	10.75	1,445	180.34	188.65	9.0	9.1
Madras .. ..	50.62	50.96	450	276.75	278.60	13.7	13.5
Orissa .. ..	23.80	24.40	245	70.86	72.65	3.5	3.5
United Provinces ..	59.06	54.93	625	448.52	417.12	22.3	20.3
West Bengal ..	32.28	28.59	420	164.71	145.90	8.2	7.1
<b>Unions and States :</b>							
Baroda .. ..	1.62	2.53	345	6.81	10.61	0.3	0.5
Himachal Pradesh ..	4.10	3.68	900	44.79	40.23	2.2	2.0
Hyderabad .. ..	26.01	25.23	130	41.08	39.86	2.0	1.9
Kashmir .. ..	7.27	7.25	280	24.73	24.66	1.2	1.2
Madhya Bharat ..	16.83	17.58	320	65.45	68.37	3.3	3.3
Mataya .. ..	3.62	3.08	730	32.09	27.30	1.6	1.3
Mysore .. ..	14.42	14.47	240	42.05	42.20	2.1	2.0
Patiala and East Punjab States Union ..	2.96	3.53	900	34.39	40.97	1.7	2.0
Rajasthan .. ..	7.73	12.59	730	68.58	111.65	3.4	5.4
Saurashtra .. ..	4.80	5.09	1,000	58.35	61.87	2.9	3.0
Travancore .. ..	3.93	4.02	410	19.57	20.01	1.0	1.0
Vindhya Pradesh ..	12.13	13.18	65	9.58	10.41	0.5	0.5
Other areas .. ..	18.25	21.87	481	95.59	127.73	4.7	6.1
Total .. ..	407.38	411.01	413	2,013.95	2,062.44	100.0	100.0

## APPENDIX II

*Number of she-buffaloes and production of buffalo milk.*

Name of units.	Animals above 3 years kept for breeding or milk production (Lakhs).		Approximate annual yield per she-buffalo. lb.	Annual production in lakh maunds.		Percentage to total buffalo milk production,	
	1940	1945		1940	1945	1940	1945
Provinces :							
Assam .. ..	1.51	1.48	315	5.78	5.67	0.2	0.2
Bihar .. ..	11.06	11.73	1,526	204.87	217.46	8.4	8.3
Bombay .. ..	14.56	14.81	840	150.19	153.45	6.2	5.8
C. P. and Berar ..	9.83	9.84	545	66.78	66.75	2.7	2.6
Delhi .. ..	0.28	0.39	2,000	6.71	9.50	0.3	0.4
East Punjab ..	12.54	13.90	2,320	353.54	391.89	14.5	15.0
Madras .. ..	28.94	29.43	800	281.29	286.12	11.5	10.9
Orissa .. ..	2.57	2.70	600	18.74	19.69	0.8	0.7
United Provinces ..	41.99	45.44	1,240	632.69	684.74	26.0	26.0
West Bengal ..	1.38	1.38	960	16.10	16.07	0.7	0.6
Unions and States :							
Baroda .. ..	3.60	4.37	1,810	79.23	96.07	3.3	3.7
Himachal Pradesh ..	1.30	1.36	1,200	18.94	19.81	0.8	0.8
Hyderabad .. ..	13.00	11.88	825	130.31	119.09	5.4	4.6
Kashmir .. ..	3.57	3.60	570	24.70	24.94	1.0	1.0
Madhya Bharat ..	8.32	9.29	645	65.22	72.82	2.7	2.8
Malaya .. ..	2.46	2.42	900	26.93	26.45	1.1	1.0
Mysore .. ..	5.36	5.61	590	38.42	40.19	1.6	1.5
Patiala and East Punjab States Union .. ..	3.23	3.83	1,687	69.20	82.43	2.8	3.1
Rajasthan .. ..	3.36	6.02	900	36.74	65.80	1.5	2.5
Saurashtra .. ..	3.85	3.74	2,500	116.88	113.50	4.8	4.3
Travancore .. ..	0.20	0.22	910	2.25	2.47	0.1	0.1
Vindhya Pradesh ..	3.55	3.98	445	19.21	21.49	0.8	0.8
Other areas .. ..	7.10	8.30	826	70.81	83.31	2.8	3.2
Total .. ..	183.56	195.72	1,101	2,435.53	2,619.71	100.0	100.0

## APPENDIX III

*Number of milking goats and production of goat milk.*

Name of units.	Milking goats (Lakhs).		Approximate annual yield per goat (lb.)	Annual production in lakh maunds.		Percentage to total goat milk pro- duction.	
	1940	1945		1940	1945	1940	1945
<i>Provinces :</i>							
Assam .. ..	Neg.	0.89	80	Neg.	0.87	Neg.	0.7
Bihar .. ..	0.89	0.67	340	3.65	2.74	2.7	2.0
Bombay .. ..	6.44	6.23	115	9.36	9.25	7.0	6.9
C. P. and Berar ..	2.90	3.22	110	3.88	4.30	2.9	3.2
Delhi .. ..	0.13	0.15	110	0.18	0.20	0.1	0.2
East Punjab ..	2.97	3.33	440	15.89	17.79	11.8	13.3
Madras .. ..	7.29	5.57	180	15.96	12.18	11.9	9.1
Orissa .. ..	0.17	0.18	200	0.42	0.43	0.3	0.3
United Provinces ..	16.52	11.46	125	25.09	17.40	18.7	13.1
West Bengal ..	3.28	3.39	80	3.19	3.29	2.4	2.5
<i>Unions and States :</i>							
Baroda .. ..	0.42	0.47	130	0.66	0.74	0.5	0.6
Himachal Pradesh ..	1.43	1.21	200	3.47	2.95	2.6	2.2
Hyderabad ..	8.93	9.81	50	5.43	5.96	4.0	4.5
Kashmir .. ..	1.18	0.88	90	1.29	0.96	1.0	0.7
Madhya Bharat ..	1.83	1.96	100	2.22	2.39	1.7	1.8
Matsya .. ..	1.91	1.95	100	2.32	2.37	1.7	1.8
Mysore .. ..	3.45	2.58	180	7.54	5.64	5.6	4.2
Patiala and East Punjab States Union .. ..	2.64	2.80	225	7.76	8.25	5.8	6.2
Rajasthan .. ..	2.91	5.30	100	3.53	6.44	2.6	4.8
Saurashtra ..	3.07	3.26	200	7.46	7.91	5.6	5.9
Travancore ..	0.04	0.03	95	0.05	0.03	Neg.	Neg.
Vindhya Pradesh ..	0.83	1.08	100	1.01	1.32	0.7	1.0
Other areas ..	10.52	15.34	107	14.10	19.94	10.4	15.0
Total ..	79.75	81.76	134	134.46	133.35	100.0	100.0

Neg.—Negligible

## APPENDIX IV

*Total production of milk in the Indian Union.*

Name of units.	Quantity (Lakh mds.)	Percent- age.	Quantity (Lakh mds.)	Percent- age.	Increase or decrease percent- age over production in 1940 (100)
	1940		1945		
<i>Provinces :</i>					
Assam .. .. .	29.51	0.7	26.48	0.6	(—)10.3
Bihar .. .. .	428.02	9.3	442.91	9.2	(+)3.5
Bombay .. .. .	205.10	4.5	211.44	4.4	(+)3.1
C. P. and Berar .. .. .	107.69	2.3	108.93	2.2	(+)1.2
Delhi .. .. .	10.79	0.2	14.08	0.3	(+)30.5
East Punjab .. .. .	549.77	12.0	598.33	12.4	(+)8.8
Madras .. .. .	574.00	12.5	576.90	12.0	(+)0.5
Orissa .. .. .	90.02	2.0	92.77	1.9	(+)3.1
United Provinces .. .. .	1,106.30	24.1	1,119.26	23.2	(+)1.2
West Bengal .. .. .	184.00	4.0	165.26	3.4	(—)10.2
<i>Unions and States :</i>					
Baroda .. .. .	86.70	1.9	107.42	2.2	(+)23.8
Himachal Pradesh .. .. .	67.20	1.5	62.99	1.3	(—)6.3
Hyderabad .. .. .	176.82	3.9	164.91	3.4	(—)6.7
Kashmir .. .. .	50.72	1.1	50.56	1.1	(—)0.3
Madhya Bharat .. .. .	132.89	2.9	143.58	3.0	(+)8.0
Mastya .. .. .	61.34	1.3	56.12	1.2	(—)8.5
Mysore .. .. .	88.01	1.9	88.03	1.8	..
Patiala and East Punjab States Union .. .. .	111.35	2.4	131.65	2.8	(+)18.2
Rajasthan .. .. .	108.83	2.4	183.89	3.8	(+)68.9
Saurashtra .. .. .	182.69	4.0	183.28	3.8	(+)0.3
Travancore .. .. .	21.87	0.5	22.51	0.5	(+)2.9
Vindhya Pradesh .. .. .	29.80	0.7	33.22	0.7	(+)11.5
Other Provinces and States .. .. .	180.50	3.9	230.98	4.8	(+) 28.0
Total .. .. .	4,583.94	100.0	4,815.50	100.0	(+)5.1

## APPENDIX V

*World's annual production of milk.*

Country.	No. of cows. (lakhs).	Annual production (lakhs. mds).	Percentage to total production.	Milk yield per cow (lb.).
<i>Europe.</i>				
Albania (1934-38) .. .. .	..	3.51	Neg.	..
Austria (1945) .. .. .	11.45	368.42	0.7	2,648
Belgium (1945) .. .. .	8.06	623.16	1.2	6,362
Bulgaria (1945) .. .. .	..	7.90	Neg.	..
Czechoslovakia (1946) .. .. .	..	655.92	1.3	..
Denmark (1942) .. .. .	13.91	894.39	1.7	5,291
Estonia (1934-38) .. .. .	..	227.30	0.4	..
Finland (1945) .. .. .	11.22	431.60	0.8	3,165
France (1945) .. .. .	68.23	2,112.59	4.0	2,548
Germany (1946) .. .. .	..	3,535.49	6.8	..
Greece (1946) .. .. .	1.17	15.67	Neg.	1,102
Hungary (1944) .. .. .	16.83	458.51	0.9	2,242
Ireland (1945) .. .. .	12.22	593.35	1.1	3,995
Italy (1945) .. .. .	32.00	367.56	0.7	945
Latvia (1934-38) .. .. .	..	442.64	0.9	..
Lithuania (1934-38) .. .. .	..	137.53	0.3	..
Luxemburg (1945) .. .. .	0.48	25.72	0.1	4,401
Netherlands (1945) .. .. .	11.67	692.87	1.3	4,885
Norway (1945) .. .. .	7.56	286.43	0.5	3,118
Poland (1946) .. .. .	25.39	748.36	1.4	2,425
Spain (1942) .. .. .	18.11	529.27	1.0	2,405
Sweden (1945) .. .. .	17.97	1,253.97	2.4	5,742
Switzerland (1945) .. .. .	8.05	568.04	1.1	5,806
United Kingdom (1945) .. .. .	24.03	2,236.46	4.3	7,658
U.S.S.R. (1934-38) .. .. .	..	6,241.09	11.9	..
Total .. .. .	..	23,457.75	44.8	..

APPENDIX V—*contd.**World's Annual production of milk—(contd.)*

Country	No. of cows (lakhs)	Annual production (lakh mds)	Percentage to total production	Milk yield per cow (lb.)
<i>North &amp; Central America.</i>				
Alaska (1939) .. .. .	..	0.72	Neg.	..
Canada (1945) .. .. .	39.98	2,141.47	4.1	4,408
Guatemala (1942) .. .. .	0.11	13.32	Neg.	9,964
Puerto Rico (1939) .. .. .	..	16.93	Neg.	..
United States of America (1946) .. .. .	388.66	15,197.43	29.1	3,218
Total .. .. .	..	17,369.87	33.2	..
<i>South America.</i>				
Argentina (1945) .. .. .	28.47	593.25	1.1	1,715
Brazil (1938) .. .. .	..	672.91	1.3	..
Chile (1934) .. .. .	3.31	118.54	0.2	2,947
Peru (1937) .. .. .	..	51.10	0.1	..
Uruguay (1943) .. .. .	22.66	105.30	0.2	382
Total .. .. .	..	1,541.10	2.9	..
<i>Asia.</i>				
<i>Burma (1940)—</i>				
Cows .. .. .	10.00	48.00	..	..
She-buffaloes .. .. .	2.00	13.00	..	..
Total .. .. .	12.00	61.00	0.1	418
<i>Indian Union (1945)—</i>				
Cows .. .. .	411.01	2,062.44	..	413
She-buffaloes .. .. .	195.72	2,619.71	..	1,101
Total .. .. .	606.73	4,682.15 <sup>(1)</sup>	9.0	..

(1) Besides this the Indian Union produces 133.35 lakh maunds of goat milk.

APPENDIX V—concl'd.  
World's Annual production of milk—concl'd.

Country	No. of cows (lakhs)	Annual production (lakhsmds.)	Percentage to total production	Milk yield per cow (lb.)
Japan (1942) .. .. .	..	95.79	0.2	..
Lebanon (1943) .. .. .	..	7.92	Neg.	..
Syria (1946) .. .. .	1.08	50.72	0.1	3,864
Turkey (1945) .. .. .	23.02	223.80	0.4	800
Pakistan (1940)—				
Cows .. .. .	82.52	883.95	..	..
She buffaloes .. .. .	30.80	767.27	..	..
Total .. .. .	113.32	1,651.22 <sup>(2)</sup>	3.2	..
TOTAL .. .. .	..	6,772.60	13.0	..
Africa—				
Algeria (1945) .. .. .	3.51	38.36	0.1	899
Egypt (1945) .. .. .	11.98 <sup>(3)</sup>	205.19 <sup>(4)</sup>	0.4	1,409
Southern Rhodesia (1945) .. .. .	..	9.75	Neg.	..
Union of South Africa (1937) .. .. .	..	58.09	0.1	..
Total .. .. .	..	311.39	0.6	..
Oceania				
Australia—				
Commonwealth (1944) .. .. .	22.93	1,338.22	2.6	4,802
Queensland (1945) .. .. .	7.42	310.20	0.6	3,440
Tasmania (1945) .. .. .	0.62	36.69	0.1	4,869
Total .. .. .	30.97	1,685.11	3.3	..
New Zealand (1945) .. .. .	17.0	1,169.41	2.2	5,660
Total .. .. .	..	2,854.52	5.5	..
GRAND TOTAL .. .. .	..	52,307.23	(100.0)	..

(2) Besides this Pakistan produce 73.15 lakh maunds of goat milk.

(3) Total of Cows and buffaloes.

(4) Total milk from cows, she-buffaloes, sheep and goats.

## APPENDIX VI

*Monthly expenditure by middle class families (Central Government employees) on dairy products during November 1945, February, May and August 1946.*

Income group.	Madras City.	Madras and Hyderabad (ex. Madras City.)	Bombay City.	Bombay Province (ex. Bombay City.)	Calcutta	Bengal and Assam (ex. Calcutta).	Delhi	United provinces.	Bihar and Orissa.	Central Provinces and Berar (including Rajputana Central India and Ajmer Merwara).
	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.	Rs. As.
Below Rs. 100 ..	16 5	15 7	12 4	16 15	8 15	10 0	..	11 3	12 11	13 3
Between Rs. 100—150 ..	20 12	24 2	24 11	16 8	12 9	17 14	28 0	20 15	17 14	20 3
Between Rs. 150—200 ..	27 5	32 10	30 13	35 0	14 14	19 9	31 0	27 2	15 13	26 0
Between Rs. 200—250 ..	34 4	30 0	39 2	29 8	17 10	21 0	32 13	23 5	26 10	29 6
Between Rs. 250—300 ..	45 0	37 0	39 1	38 13	24 15	25 2	41 14	44 12	281 4	39 14
Rs. 300 and above ..	51 14	38 8	47 9	46 2	34 11	37 13	50 4	41 9	35 10	45 7
All Groups ..	25 10	25 0	34 10	27 5	20 0	21 3	38 2	22 7	21 9	24 10



**APPENDIX VII**  
*Annual production and utilization of milk in the Indian Union.*  
(In lakh maunds).

Province or State.	Total Milk production	Fluid milk		Ghee		Dahi		Butter		Khoa		Ice Cream		Cream		Total quantity converted into products.	
		Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent
Provinces.																	
Assam ..	26.48	15.01	56.7	6.67	25.2	1.43	5.4	1.25	4.7	2.12	8.0	..	..	..	..	11.47	43.3
Bihar ..	442.91	203.74	46.0	180.26	40.7	48.72	11.0	4.87	1.1	5.32	1.2	..	..	..	..	239.17	54.0
Bombay ..	211.44	58.78	27.8	113.54	53.7	23.26	11.0	12.05	5.7	2.54	1.2	1.27	0.6	Neg	Neg	152.66	72.2
C. P. & Berar ..	108.23	12.96	11.9	87.15	80.0	1.63	1.5	6.75	6.2	0.44	0.4	Neg	Neg	Neg	Neg	95.97	88.1
Delhi ..	14.08	11.15	79.2	2.64	18.7	0.10	0.7	0.04	0.3	0.11	0.8	Neg	..	0.04	0.26	2.93	20.8
East Punjab..	598.33	174.11	29.1	179.50	30.0	47.87	8.0	179.50	30.0	2.39	0.4	5.98	1.0	8.98	1.5	424.22	70.9
Madras ..	576.90	184.61	32.0	299.99	52.0	86.54	15.0	3.46	0.6	1.15	0.2	0.86	0.15	0.29	0.05	392.29	68.0
Orissa ..	92.77	54.36	58.6	36.37	39.2	1.12	1.2	..	..	0.46	0.5	..	..	0.46	0.5	38.41	41.4
United Provinces ..	1,119.26	439.87	39.3	359.28	32.1	95.14	8.5	44.77	4.0	152.22	13.6	11.19	1.0	16.79	1.5	679.39	60.7
West Bengal ..	165.26	107.58	65.1	52.06	31.5	3.31	2.0	0.99	0.6	1.32	0.8	..	..	..	..	57.68	34.9
Unions & States.																	
Baroda ..	107.42	47.05	43.8	50.27	46.8	4.94	4.6	0.11	0.1	3.98	3.7	..	..	1.07	1.0	60.37	56.2
Himachal Pradesh ..	62.99	30.37	49.0	22.05	35.0	7.56	12.9	1.07	1.7	1.44	2.3	..	..	..	..	32.12	51.0

APPENDIX VII—*contd.*

Province or State	Total milk production	Fluid milk		Ghee		Dahi		Butter		Khoa		Ice Cream		Cream		Total quantity converted into products.	
		Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent	Quantity	Per cent
Hyderabad ..	164.01	38.75	23.5	109.67	66.5	7.92	4.8	3.79	2.3	3.79	2.3	0.66	0.4	0.33	0.2	126.16	76.5
Kashmir ..	50.56	26.14	51.7	16.89	33.4	7.13	14.1	0.10	0.2	0.36	0.6	..	..	..	..	24.42	48.3
Madhya Bharat ..	143.38	55.57	38.7	66.76	46.5	15.79	11.0	0.72	0.5	4.31	3.0	..	..	0.43	0.3	88.01	61.8
Madhya ..	56.12	15.27	27.2	33.67	60.0	4.49	8.0	1.63	3.0	0.69	1.6	..	..	0.11	0.2	40.85	72.8
Mysore ..	88.03	17.69	20.1	32.05	36.4	16.73	19.0	19.01	21.6	2.25	2.9	..	..	..	..	70.34	79.9
Patiala & East Punjab States Union.	131.65	53.68	40.8	57.19	43.5	12.04	9.1	4.52	3.4	3.53	2.7	..	..	0.66	0.5	77.97	59.2
Rajasthan ..	183.89	39.54	21.5	128.72	70.0	11.03	6.0	0.92	0.5	3.65	2.0	..	..	..	..	144.35	78.5
Saurashtra ..	183.28	64.51	35.2	85.78	46.8	20.16	11.0	10.45	5.7	2.20	1.2	Neg	..	0.18	0.1	18.77	64.5
Tamil Nadu ..	22.51	8.62	38.3	12.55	55.5	1.35	6.0	0.02	0.1	0.02	0.1	..	..	..	..	13.89	61.7
Vindhya Pradesh ..	33.22	14.35	43.2	14.02	42.2	3.32	10.0	0.47	1.4	1.09	3.0	..	..	0.06	0.2	18.87	56.8
Other Provinces & States	230.98	66.75	28.9	138.13	59.8	16.86	7.3	5.31	2.3	3.70	1.6	..	Neg	0.23	0.1	164.23	71.1
Total ..	4,815.50	1,740.96	36.2	2,085.16	43.3	438.44	9.1	301.55	6.3	119.50	4.1	19.98	0.4	29.63	0.6	3,074.54	63.7

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## APPENDIX VIII

*Cost of production of milk.*

						Rs.	A.	P.
<i>College, Dairy, 1945-46. Government Agricultural College Coimbatore—</i>								
Maintenance of cattle—fodder—	..	..	..	..	..	3,611	14	11
„ „ —concentrates	..	..	..	..	..	2,670	11	9
Wages—regular coolies	..	..	..	..	..	190	7	7
Wages—casual	..	..	..	..	..	520	4	11
Allowances and presents	..	..	..	..	..	54	9	7
Yard articles written off	..	..	..	..	..	30	1	3
Transport charges	..	..	..	..	..	102	7	0
Repairs	..	..	..	..	..	39	3	3
Consumable stores	..	..	..	..	..	69	6	9
Loss by revaluation of cattle	..	..	..	..	..	80	0	0
Total						7,369	3	0
Salaries of staff	..	..	..	..	..	3,337	9	6
Postage and stationery	..	..	..	..	..	108	12	7
Depreciation on buildings	..	..	..	..	..	64	2	3
Audit fees	..	..	..	..	..	174	0	11
Leave salary and pensionary contribution	..	..	..	..	..	536	12	0
Interest on capital	..	..	..	..	..	1,294	11	0
Total						5,516	1	0
GRAND TOTAL						12,885	4	0
By profit on revaluation of cattle	..	..	..	..	..	1	0	0
Value of dung to farm	..	..	..	..	..	200	0	0
Net cost of production	..	..	..	..	..	12,885	4	0

Milk produced=43,752 lbs.

The cost of production of 1 lb. of milk (excluding 350 lbs. Colostrum) works out to Re. 0-4-7.13.

# APPENDIX VIII—concl'd.

## Livestock Research Station, Hosur (1946-47)—

Rs. A. P.

Maintenance of cattle (milk) including concentrates, fodder, attend-  
ance, depreciation, interest on capital, medicine, etc. .. .. 58,460 10 0

### Supervision charges—

1/10th of Superintendent's pay, 1/2 of Fieldman's and Maistry's  
and full pay of Manager and Milk Recorder .. .. 1,860 0 0

Total .. .. 60,321 0 0

Output of milk = 295,760 lbs.

Therefore, cost of 1 lb. milk Re 0-3-3

..

## 1947-48.

Maintenance of cattle—fodder .. ..	10,500 0 0
Maintenance of concentrates .. ..	47,856 0 0
Wages—regular coolies .. ..	7,500 0 0
Wages—casual .. ..	2,500 0 0
Articles written off .. ..	50 0 0
Repairs .. ..	525 0 0
Consumable stores .. ..	300 0 0
Loss by revaluation .. ..	380 0 0

Total .. .. 69,611 0 0

Salaries of staff .. ..	2,916 0 0
Postage and stationery .. ..	15 0 0
Depreciation on buildings .. ..	948 0 0
Leave salary and pensionary contribution .. ..	365 0 0

Total .. .. 4,244 0 0

GRAND TOTAL .. .. 73,855 0 0

By profit on revaluation .. .. 1,280 0 0

Value of dung to the farm .. .. 1,563 0 0

Total .. .. 2,843 0 0

Milk produced = 527,872 lbs.

Cost of production of 1 lb. of milk Re.0-2-2-2

## APPENDIX IX.

(a) *Cost of production of reconstituted milk.*

Production cost for 1,000 Madras Measures (50 mds.) of reconstituted milk.

(Reconstituted Milk Factory, Madras).

	Rs.	A.	P.
Milk powder 400 lbs. @ 10 annas per lb.	250	0	0
Cocoanut oil 144 lbs. @ 14 annas per lb.	126	0	0
Carotene 2 grams @ Rs. 3-8-0 per gram	7	0	0
Furnace oil 20 gallons @ 7 as. per gallon	8	13	0
Refrigeration and electric charges	40	0	0
Washing soda 10 lbs. @ 2 as. per lb.	1	4	0
Pay of staff	46	0	0
Pay of coolies	20	0	0
Other contingencies	5	0	0
Water	2	0	0
Superior staff administration	10	0	0
Interest on capital	20	0	0
Depreciation	45	0	0
Leave and pensionary contributions	12	0	0
Cost of wasted milk and condemned milk	4	0	0
<b>Cost of 1,000 measures</b>	<b>597</b>	<b>0</b>	<b>0</b>
Cost of production per pound = Re. 0-2-4-7.			

(b) *Cost of preparation of toned milk at Anand and Bombay.*(i) *At Anand—(delivered at Bombay)—*

	Per pound of toned milk.
	AS. P.
1. Cost of proportionate quantity of raw milk used for the purpose at 6 annas per seer .. .. .	2 1-5
2. Proportionate cost of milk powder at a fixed price of 6 annas per pound ..	0 3-1
3. Pasteurisation, handling, refrigerated rail transport (in full wagon load), return of empty cans, handling expenses and cold storage charges at Bombay	1 5-8
	<hr/>
Total cost ..	3 10-4

(ii) *At Bombay—*

1. Cost of proportionate quantity of raw milk used for the purpose at 12 annas per seer	3	5-2
2. Proportionate cost of powder	0	3-8
3. Preparation expenses etc.	0	3
	<b>4</b>	<b>0</b>

## APPENDIX X

*Milk co-operative unions and societies functioning during 1948 in the Indian Union.*

Province	Name of the Union or Society.	Years to which the figures relate.	No. of primary societies.	No. of members.	AVERAGE QUANTITY OF MILK HANDLED PER DAY.		Profit (+) or loss (-).
					From members.	From non-members.	
					6	7	
					Mds. Srs.	Mds. Srs.	Rs. A. P.
Madras	(1) Ambur Coop. Milk Supply Union, Ltd., Ambur	1948-47	6	40	6 16	Nil	..
	(2) Bezvada Milk Supply Union Ltd., Bezvada	"	5	73	6 12	..	(+) 1,274 0 0
	(3) Bhimavaram Coop. Milk Supply Union, Bhimavaram.	"	3	17	0 10½	..	Nil.
	(4) Calicut Coop. Milk Supply Union, Ltd., Calicut	"	Nil	695	18 0	..	12,987 0 0
	(5) Chittoor Coop. Milk Supply Union Ltd., Chittoor.	"	7	302	37 20	..	(-) 1,151 0 0
	(6) Cocanada Coop. Milk Supply Union, Ltd., Cocanada.	"	4	40	0 37	Nil	Loss.
	(7) Coimbatore Coop. Milk Supply Union, Ltd., Coimbatore.	"	25	25	138 32	..	(+) 8,381 0 0
	(8) Dindigul Coop. Milk Supply Society Ltd., Dindigul.	"	3	142	4 0	0 20	(-) 1,251 0 0
	(9) Ellore Milk Supply Union, Ltd., Ellore	"	3	25	0 5	1 34	(-) 616 0 0
	(10) Kodakanal Coop. Milk Supply Union, Kodakanal.	"	4	85	4 0	..	(+) 408 0 0
	(11) Kurnool Coop. Milk Supply Society Ltd., Kurnool.	"	2	106	6 0	5 0	(+) 1,788 9 0
	(12) Madras Coop. Milk Supply Union Ltd., Ayana-varam, Madras.	"	87	79	304 17	16 0	(+) 17,660 9 0
	(13) Madura City Coop. Milk Supply Union Ltd., Madurai.	"	20	3	62 20	..	(-) 30,967 0 0
	(14) Mangalore Coop. Milk Supply Union, Ltd., Mangalore.	"	4	87	16 0	6 0	(-) 5,561 2 0

## APPENDIX X—contd.

1	2	3	4	5	6	7	8
Madras—contd.	UNIONS (contd.)						
	(15) Padakol Coop. Milk Supply Union, Padakol	1946-47	4	19	Mds. S.s. 3 23½	Mds. S.s. 0 36½	Rs. A. P. (-) 838 0 0
	(16) Paldi Coop. Milk Supply Union, Paldi	"	5	90	12 24	4 0	(+) 1,663 0 0
	(17) Rajahmundry Coop. Milk Supply Union, Ltd., Rajahmundry.	"	4	29	6 10	1 15	Profit.
	(18) Salem City Coop. Milk Supply Union Ltd., Salem.	1947-48	6	411	9 34	0 6	(-) 1,257 11 0
	(19) Tanjore Coop. Milk Supply Union, Tanjore	1946-47	14	23	14 10	19 22	(-) 895 13 0
	(20) Trienry Sri Rangam Milk Supply Union, Trichy.	"	7	364	640 0	"	(+) 4,890 0 0
	(21) Vellore Coop. Milk Supply Union Ltd., Vellore	"	13	60	32 11	4 3	(+) 401 0 0
	(22) Vizagapatam Coop. Milk Supply Union Ltd., Alipuram.	"	5	47	0 9	0 7½	(-) 1,178 7 0
	Total		231	2,762	1,324 11	59 24	
United Provinces	(23) Allahabad Coop. Milk Supply Union, Ltd., Allahabad.	1948-49	11	419	44*	"	"
	(24) Banaras Coop. Milk Supply Union, Ltd., Banaras.	1948-49	29	"	35*	"	"
	(25) Kanpur Coop. Milk Supply Union, Ltd., Kanpur.	1948-49	56	"	60*	"	"
	(26) Lucknow Coop. Milk Supply Union, Ltd., Lucknow.	1947-48	73	28	44 10*	"	(+) 125 0 0
	Total		169	447	183 10	"	"
West Bengal	(27) Cooperative Milk Societies Union Ltd., Cal- cutta.	1946-47	139	139	90 0	25 0	(+) 41,815 0 0
Bombay	(28) Sholapur Coop. Milk Supply Union, Ltd., Sholapur.	1946-47	10	270	Nil	3 5	(+) 1,626 0 0
	Total Unions		549	3,618	1,597 21	87 29	

\* Includes quantity from non-members also.





# APPENDIX X—contd.

1	2	3	4	5	6	7	8
	SOCIETIES—contd.				Mds. Srs.	Mds. Srs.	Rs. A. P.
	(47) Kanchela Milk Supply Society Ltd. Kanchela	1946-47	..	20	Not working at present.		
	(48) Karuppathy Coop. Milk Supply Society, Karuppathy.	"	..	49	2 10	..	..
	(49) Karaikudi Coop. Milk Supply Society Ltd., Karaikudi.	"	..	287	13 30	..	Profit (Unaudited).
	(50) Karur Milk Supply Society, Karur	Recently started	..	51	..	..	..
	(51) Kumbakonam Milk Supply Coop. Society, Kumbakonam.	1946-47	..	219	..	2 20	Loss.
	(52) Lalgudi Milk Supply Society, Lalgudi	"	..	153	80 0	..	(+) 527 13 0
	(53) Mannargudy Milk Supply Coop. Society, Mannargudy.	1945-46	..	745	..	8 16	(+) 1,026 0 0
	(54) Manopuram Milk Supply Society, Manopuram	1947	..	43	1 20	..	(+) 38 0 0
	(55) Manur Milk supply Society, Manur, Distt. Chittoor.	..	..	27	Newly started society.		
	(56) Mayavaram Milk Supply Coop. Society, Mayavaram.	1946-47	..	92	..	2 10	Loss.
	(57) M. Kannanoor Milk Supply Society, M. Kannanoor.	..	..	..	Organised for Ex-tappers.		
	(58) Mettupalayam Milk Supply Society, Mettupalayam.	1946-47	..	2	6 6	2 4	(+) 614 9 0
	(59) Mukteshwarapuram Milk Supply Society Ltd., Mukteshwarapuram.	"	..	57	0 37	0 16	105 14 0
	(60) Mutharasanaller Milk Supply Society, Mutharasanaller.	..	..	21	Organised for Ex-tappers.		
	(61) Nagapatam Milk Supply Society, Nagapatam	1946-47	..	18	..	0 10	Loss.
	(62) Nagari Milk Supply cum Cattle Breeding Coop. Society, Nagari.	..	..	33	Newly started society.		



## APPENDIX X—contd.

1	2	3	4	5	6	7	8
							Ra. A. P.
<b>SOCIETIES—contd</b>							
<b>Madras—contd</b>							
	(83) Tiruvannamalai Coop. Milk Supply Society Ltd., Tiruvannamalai.	"	..	335	7 31	Nil	(-) 1,150 0 0
	(84) Tirupathi Milk Supply Society, Tirupathi ..	1946-47	..	35	1 20	..	..
	(85) Tirupathur Coop. Milk Supply Society Ltd., Tirupathur.	"	..	320	8 30	Nil.	Nil.
	(86) Tirupur Milk Supply Society, Tirupur ..	"	..	224	12 20	..	(+) 1,045 0 0
	(87) Tiruvarur Milk Supply Coop. Society, Ltd., Tiruvarur.	"	..	161	..	1 30	Profit.
	(88) Tuticorin Coop. Milk Supply Union Ltd., Tuticorin.	1947-48	..	541	7 20	..	(-) 2,318 0 0
	(89) Vedadri Milk Supply Society Ltd., Vedadri	1946-47	..	20	0 37	0 16	..
	(90) Villupuram Coop. Milk Supply Society Ltd., Villupuram.	"	..	210	4 10	..	(-) 462 11 0
	(91) Virudhunagar Coop. Milk Supply Society, Virudhunagar.	"	..	533	21 0	..	(-) 3,000 0 0
	(92) Udumalpet Milk Supply Society, Udumalpet	"	..	298	17 38	..	(+) 1,463 5 0
	Total		..	12,225	433 15½	26 10½	
Bihar	(93) Milk Consumer's Coop. Society, P.O. Gaya	"	..	11	0 2½	..	Small profits.
Baroda	(94) Baroda Coop. Milk Depot., Baroda	"	..	256	..	10 15	(+) 3,040 4 9
	(95) Padra Coop. Milk Supply Society, Padra	"	..	89	..	..	(-) 415 10 1
	Total		..	845	..	10 15	

Society Name	Year	No.	126	Nil	1 0	(-) 6,789 0 0
(96) Ahmednagar Coop. Dairy Society Ltd., Ahmednagar.	"	"	126	Nil	1 0	(-) 6,789 0 0
(97) Alarpura Coop. Milk Producers Society, Ltd., Alarpura.	"	1	66	10 2	..	..
(98) Ashewadi Coop. Thrift & Credit Society, Ltd., Nasik.	"	..	42	14 20	0 20	..
(99) Belgum Dairy Coop. Society, Belgum	"	..	46	1 2½	Nil	(+) 502 1 6
Bombay Suburban Cattle Owners' Coop. Dairy Society Ltd.—						
(100) Andheri .. .. .	1947	..	134	29 0	..	Loss.
(101) Borivli .. .. .	"	..	35	10 0	..	Do.
(102) Danisar .. .. .	"	..	24	5 0	..	Do.
(103) Goregaon .. .. .	"	..	46	9 0	..	Do.
(104) Jogeshwari .. .. .	"	..	64	20 0	..	Do.
Bombay Suburban Cattle Owners' Coop. Dairy Society Ltd.—						
(105) Malad .. .. .	1947	..	63	5 0	..	Loss.
(106) Santa Cruz .. .. .	"	..	317	60 0	..	Do.
(107) The Bagalkot Coop. Dairy Society Ltd., Bagalkot.	1946-47	..	163	2 14½	..	(+) 981 14 1
(108) Broach City Coop. Milk Supply Society Ltd., Broach.	"	1	49	..	..	..
(109) Choriyasi Taluka Coop. Milk sale Society Ltd. Choriyasi, Dist., Surat.	"	1	358	28 0	0 12	(+) 846 0 0
(110) Goalpara Coop. Milk Producers Society Ltd., Goalpara.	"	1½	64	8 17½	..	(+) 54 0 0
(111) Hadgud Coop. Milk producers Society Ltd., Hadgud.	"	1½	55	8 16	..	(-) 1,232 0 0
(112) Jalgaon Taluka Development Association, Jalgaon.	"	..	8,000	7 39½	..	(+) 1,284 0 0

APPENDIX X—*conold.*

1	2	3	4	5	6	7	8
	SOCIETIES— <i>conold.</i>				Md. Srs.	Md. Srs.	Rs. A. P.
<i>Bombay—conold.</i>	(113) Jambhvel Coop. Milk Producers Society Ltd., Jambhvel.	1947	1	49	0 13	..	(—) 36 0 0
	(114) Kaira Distt. Coop. Milk Producers Union Ltd., Anand.	"	1	41	..	..	..
	(115) Nadiad Dairy Coop. Society Ltd., Nadiad, Distt. Kaira.	"	1	35	0 13	1 7	(+) 85 0 0
	(116) Nasik Central Coop. Milk Supply Union Ltd., Nasik.	..	..	14	3 0	0 20	New Society.
	(117) National Milk Producers Coop. Dairy Society Ltd., Goregaon.	1947	..	99	2 0	..	Loss.
	(118) Panoli Coop. Milk Producers Society, Ankleshwar, Broach.	1946-47	1	85	..	..	..
	(119) People's Commonwealth Sahakari Dairy Society Ltd., Poona.	..	1	141	30 0	123 0	..
	(120) Ravalpura Coop. Milk producers Society Ltd., Ravalpura.	..	1	14	7 29	..	..
	(121) Samarkha Coop. Milk Producers Society Ltd., Smarkha.	"	1	136	21 5	..	(+) 387 0 0
	Total		12	10,266	295 5½	126 19	..
	(122) Telankheri Dairy Coop. Society, Nagpur	1946-47	..	26	16 6½	5 34½	..
	Total Societies		13	22,873	744 30	168 39	..
	Grand Total.		302	26,491	2,342-11	2,342-11	..
C. P. & Berar							

## APPENDIX XI

*Progress made by some Co-operative Unions during the past ten years.*

Name of the Union or Society.	Particulars.	1937-38.	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.	1946-47.
(1) The Coimbatore Co-operative Milk Supply Union Ltd., Coimbatore.	(a) No. of primary societies	4	5	6	6	6	8	9	8	15	23
	(b) No. of members	23	25	25	25	25	25	24	25	25	25
	(c) Annual purchase of milk (Rs.).	59,547	57,314	83,015	108,083	111,745	174,479	300,800	808,632	1,447,387	823,274
(2) The Madras Co-operative Milk Supply Union Ltd., Madras.	(a) No. of primary societies	15	14	14	16	15	17	24	39	77	87
	(b) No. of members	14	15	15	19	20	21	26	49	91	79
	(c) Annual purchase of milk (Rs.).	166,210	206,512	230,541	248,136	244,115	274,769	350,612	765,482	2,145,206	2,558,539
(3) The Madras City Co-operative Milk Supply Union Ltd., Madras.	(a) No. of primary societies	..	4	5	6	6	13	15	19	22	20
	(b) No. of members	..	3	3	4	3	3	3	4	3	3
	(c) Annual purchase of milk (Rs.).	..	75,382	82,920	92,740	109,124	387,465	395,858	470,225	608,412	4,56,091
(4) The Allahabad Co-operative Milk Supply Union Ltd., Allahabad.	(a) No. of primary societies	..	..	..	..	..	..	..	3	7	17
	(b) No. of members	..	..	..	..	..	..	..	40	238	419
	(c) Annual purchase of milk (Rs.).	..	..	..	..	16,105	37,592	64,693	62,468	93,627	97,996
(5) The Calcutta Co-operative Milk Societies Union Ltd.	(a) No. of primary Societies	123	123	124	127	..	..	..	139	139	139
	(b) No. of members	200,000	188,000	218,000	240,000	..	..	..	1134,000	1,159,200	952,300
	(c) Annual purchase of milk (Rs.).	..	..	..	..	..	..	..	..	..	..
(6) The Telankheri Dairy Co-operative Society Nacant.	(a) No. of primary societies	..	..	..	..	..	..	..	..	..	..
	(b) No. of members	17	17	16	16	16	26	26	26	26	26
	(c) Annual purchase of milk (Rs.).	64,297	69,320	68,758	69,935	85,992	116,791	121,450	140,912	115,125	95,325

**APPENDIX XII**  
*Purchases and Sales under the Bombay Milk Plan.*  
 (From March 1947 to January 1948).

	PURCHASES.			Total.	SALES.			Over head charges per seer.			
	Anand milk.		Whole milk.		Toned milk.						
	Mds.	Sr. Ch.			Mds.	Sr. Ch.					
1947.	Mds.	Sr. Ch.	Mds.	Sr. Ch.	Mds.	Sr. Ch.	Mds.	Sr. Ch.	Rs.	A.	P.
March ..	6,237 18 0	8,733 22 0	15,071 0 0	14,245 33 10	720 30 0	14,963 23 10	0 3 2-21				
April ..	4,133 31 8	7,125 21 0	11,259 12 8	11,259 12 8	2,170 10 0	13,429 22 8	0 3 5-84				
May ..	6,887 16 10	10,254 28 0	17,242 4 10	15,828 2 0	2,640 30 0	18,468 32 0	0 4 4-26				
June ..	6,697 12 0	7,024 33 0	13,722 5 10	13,456 26 10	2,640 30 0	16,097 16 10	0 3 8-0				
July ..	12,893 5 14	7,238 0 10	20,136 5 14	19,304 5 12	2,495 10 0	21,799 15 12	0 2 1-03				
August ..	13,840 14 6	10,885 4-8	24,725 18 14	23,096 26 8	3,238 10 0	26,334 26 8	0 2 5-9				
September ..	14,906 5 8	11,134 31 0	26,040 36 8	22,762 33 0	4,052 10 0	26,815 3 0	..				
October ..	13,940 34 0	12,734 18 0	26,675 32 0	26,090 12 0	4,489 20 0	30,579 22 0	0 1 11-65				
November ..	14,056 4 0	13,916 29 0	38,017 24 0	27,316 34 0	5,520 0 0	32,836 34 0	0 1 6-63				
December ..	14,779 28 0	14,532 6 0	29,361 34 0	25,927 26 0	5,835 0 0	31,762 26 0	0 1 5-63				
1948.											
January ..	15,697 32 8	14,712 28 0	30,410 20 8	27,423 30 0	6,567 17 8	33,991 7 8	0 1 2-9				

## GLOSSARY OF INDIAN TERMS.

## A

*Adhiari*—A system, prevalent in Northern India, under which professional graziers are entrusted with the looking after of dry cattle, to be returned to their owners after calving. For this, the latter have to pay the graziers, as maintenance charges, half the value of the animal, as assessed by a third party.

*Ata*—Wheat flour.

## B

*Bakhri*—Literally salty, in conjunction with milch cattle, the term means animals in an advanced stage of lactation, whose milk is generally salty in taste.

*Band*—Seasonal contract between producers, collectors and distributors, regarding supply and price of milk.

*Batloi*—A round bottomed brass or aluminium vessel, generally much larger than the *lota* in capacity.

*Bahangi*—A pole, the ends of which are connected by ropes to a flat contrivance for carrying loads the pole being balanced on the shoulder.

*Bhayya*—A professional milk distributor.

*Bundi*—Same as *band*.

## C

*Chalan*—An invoice or a document of that kind.

*Chapatty*—Indian bread.

*Charwaha*—A cattle grazier.

*Chass*—Butter milk obtained by churning curd in the making of country butter.

*Chhana*—Milk solids extracted by coagulation and drainage of whey.

*Chhatak*—1/16 of a seer.

*Chunga*—A hollow bamboo container used for carrying milk in Assam.



**D**

*Dalal*—A broker.

*Dauna*—A receptacle made by putting together dry or green leaves of certain trees and used for retailing curd, etc.

*Desi*—Local ; indigenous.

*Dhingla*—A coin common in the Western India. It is a little less than a pice and  $1\frac{1}{16}$ th of a kauri.

*Diwali*—A Hindu festival occurring in October or November when illuminations take place on a large scale.

**E**

*Edungali*—A unit of capacity equivalent to 48 fluid ounces, common in Cochin and Travancore.

**G**

*Gaolic*—One who maintains cattle for production and sale of milk.

*Garvi*—A brass vessel used for measuring milk in the Punjab. Its capacity is usually  $1\frac{1}{4}$  standard seers.

*Ghosi*—Same as *gaolic*.

*Gowala*—Same as *ghosi* or *gaolie*.

*Gowshala*—A charitable institution or asylum for old and invalid cows, calves and bullocks.

**H**

*Halwa*—An Indian pudding made of flour, ghee (clarified butter), sugar and spices.

*Halwai*—A maker of Indian sweetmeats.

*Holi*—A Hindu festival occurring in February or March.

**J**

*Janam Ashtami*—A Hindu festival occurring in July or August.

**K**

*Kachcha*—Literally, raw or unfinished. The word has a wide range of meaning with reference to context, e.g. *kachcha* roads mean unmetalled roads.

*Kalsia*—A measure used in the milk trade in Saurashtra. Its capacity differs from state to state in the Saurashtra Union.

*Karahi*—A round bottomed pan made of iron used by the *halwai* for boiling milk, etc.

*Kauri*—A coin equivalent to about 4 annas and in common use in Saurashtra.

*Khoa*—An indigenous milk product made by evaporating from milk the major part of its water, in an open *pau*. The product contains only about 20 to 25 per cent. moisture.

*Khulla Veohar*—Literally, open transaction. In case of milk, the term refers to sales which have not been contracted in advance.

*Khurchan*—An indigenous milk product comprising of clotted milk solids obtained by scraping off the flakes from the sides of *karahi*, in which milk has been concentrated.

*Kulfi*—Indian ice-cream, frozen in small conical earthen or tin-containers.

*Kullhar*—A conical earthen cup used as a container by the *halwai* for selling milk.

## L

*Lahori*—Pertaining to the city of Lahore.

*Lassi*—A drink made by beating up curd and adding to it water and sugar or salt to taste. Raw milk diluted with water is also drunk as *lassi*.

*Lota*—A round bottomed metallic vessel with capacity ranging from 1 to 1-1/2 seers, used for measuring milk.

## M

*Malai*—Clotted cream which comes up as a skin over slowly simmering milk.

*Malai-ka-baraf*—Indigenous ice-cream, frozen in cylindrical blocks, generally crystalline in texture.

*Mandi*—A wholesale market.

*Mattha*—Same as *chass*.

*Mela*—A fair.

## N

*Nali*—A unit of capacity equivalent to 12 fluid oz. common in Cochin and Travancore States.

## O

*Ollock*—A measure equivalent to 8 oz. common in parts of Madras Province.

**P**

*Padi*—A unit of capacity equivalent to 27.1½ ounces common to Nagercoil and Shencottah areas of Travancore State.

*Panchayat*—A body of elected persons to look after the working of a village organisation.

*Pao*—One quarter; a quarter seer.

*Pinjrapole*—Same as *gowshala*, but these institutions accept all kinds of stock, *e.g.*, horses, camels buffaloes etc.

*Pol*—A term used in Western India for a narrow street.

*Pakka*—Final ; real ; mature ; full.

**R**

*Rabri*—An indigenous milk product obtained by partly concentrating milk over open fire and finished off in a creamy consistency.

*Rasgulla*—A Bengali sweetmeat made from *Chhana*.

**T**

*Tamer*—An assemblage of milk containers tied together on a float made up of thick pieces of bamboo. It is used for transporting milk on the river Ganges near Hardwar.

*Tonga*—A two wheeled carriage drawn by a pony.

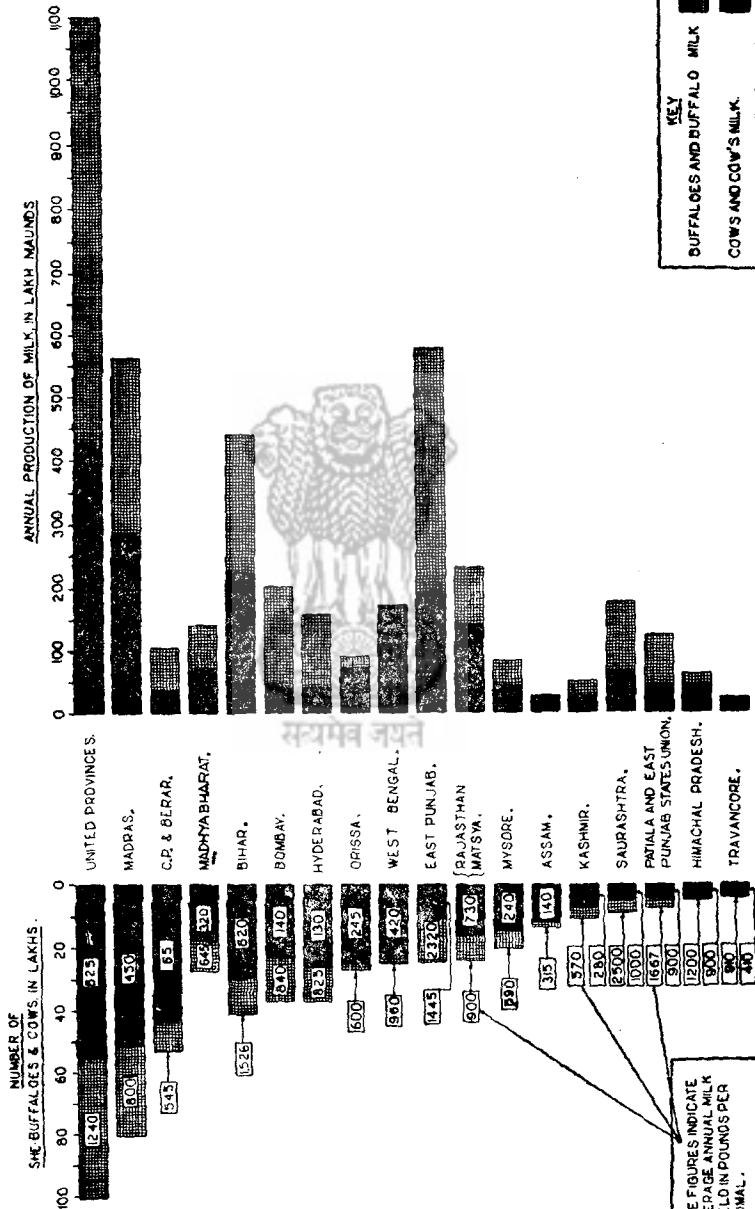
**V**

*Vanaspati*—A product manufactured by hydrogenating Vegetable oils. It is made to resemble ghee in every respect.

**W**

*Wakf* A Mohammedan charitable fund.

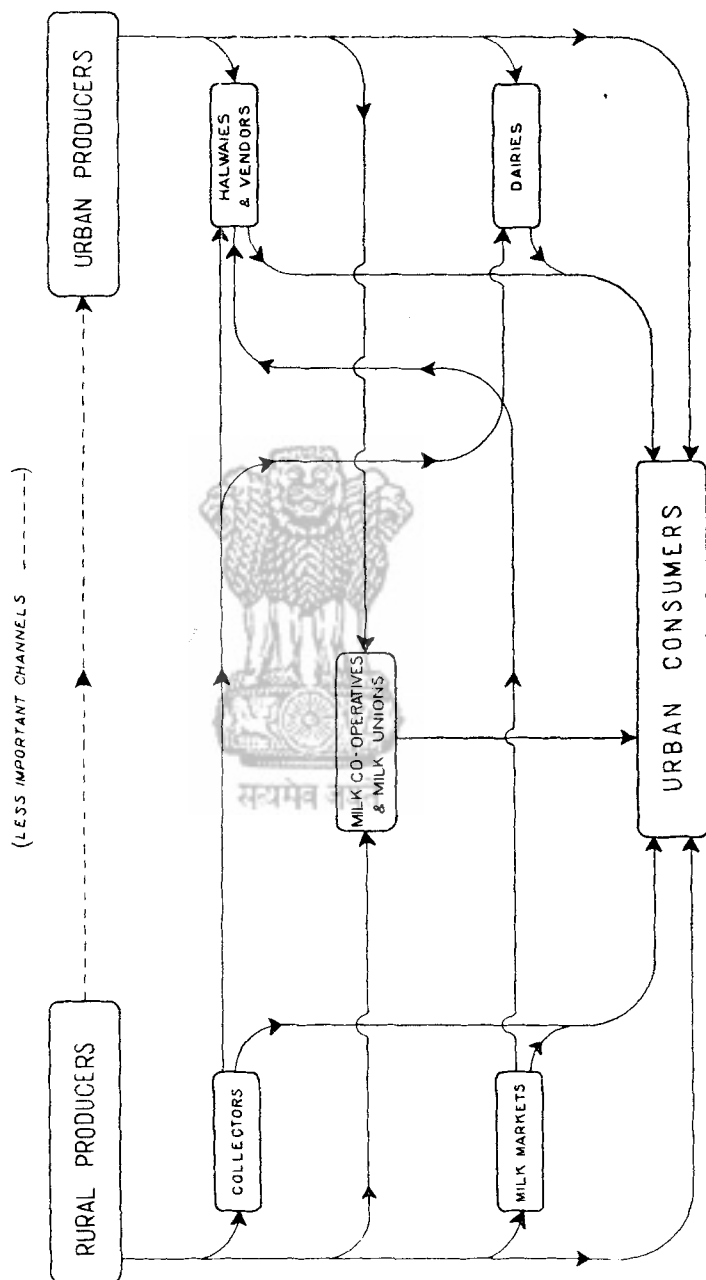
# NUMBER OF MILCH CATTLE, YIELDS & ANNUAL PRODUCTION OF MILK IN DIFFERENT AREAS OF THE INDIAN UNION.





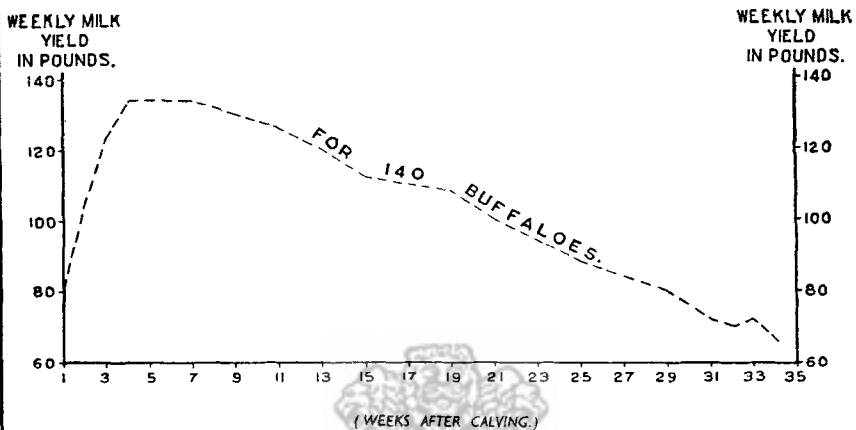
Milk processing plant at a Military Dairy Farm.

## COMMON CHANNELS OF ASSEMBLING & DISTRIBUTION OF MILK FOR MEETING THE URBAN DEMAND .



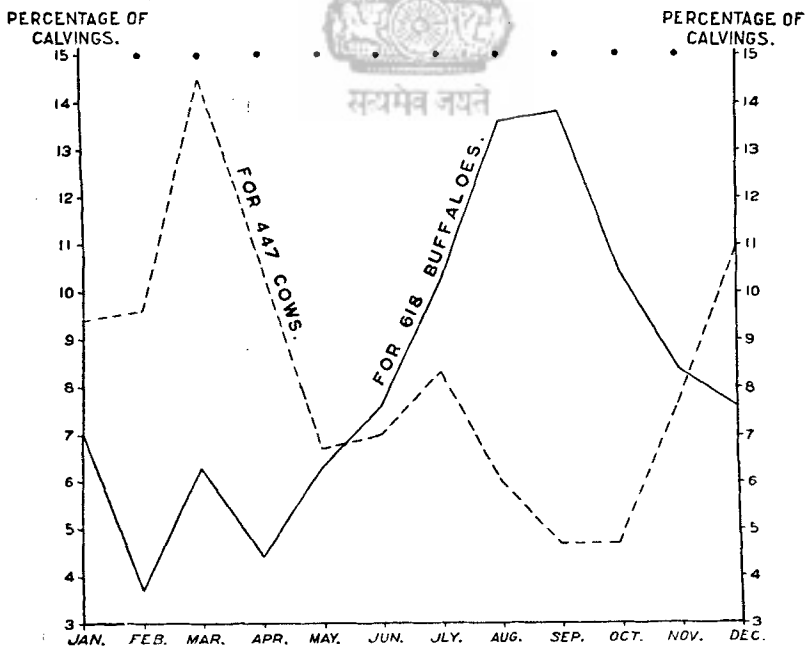
## LACTATION CURVE FOR BUFFALOES.

(AT MILITARY DAIRY FARMS.)



## DISTRIBUTION OF CALVINGS.

(AT MILITARY DAIRY FARMS.)





Transport of milk by women in Surat.

सत्यमेव जयते



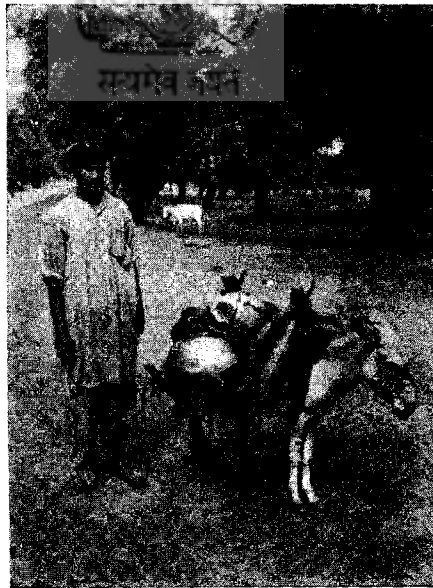
Transport in kerosene tins to a creamery in Anand.



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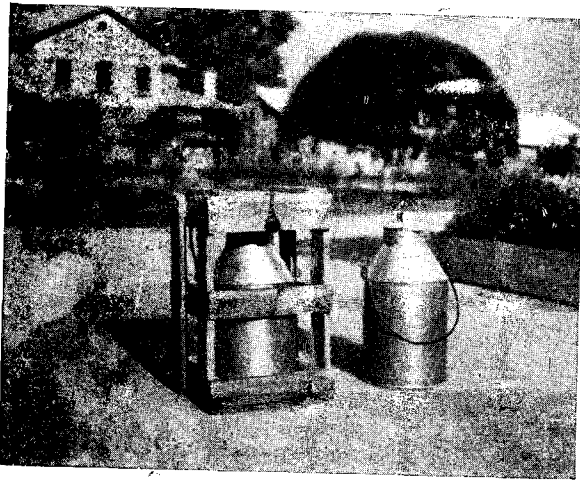
Transport of milk by bahangi in Kathiawar. Note the several vessels placed one upon the other.



Transport of milk on pack-donkeys.



Transport of milk on head-loads in earthen pots in Kashmir.



Milk churn packed in crate for transport on head-load from Tangmarg to Gulmarg in Kashmir.

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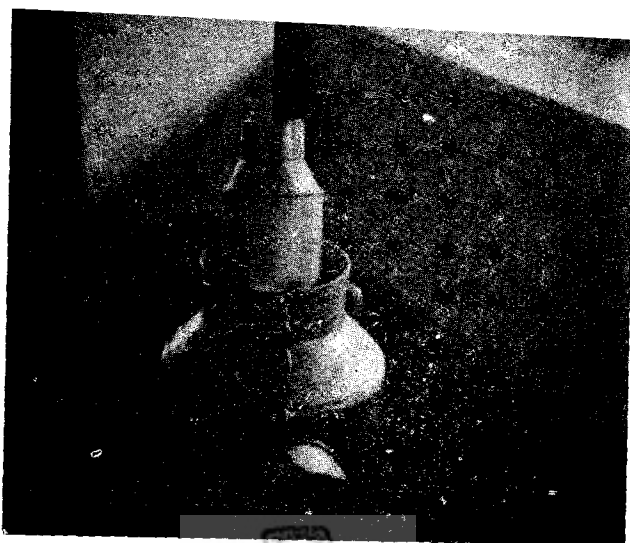
Transport by bullock-cart to creameries at Anand



Transport of milk in battlois in the East Punjab.  
Note the usage of leaves for closing the mouths of the vessels.



Transport of milk on bicycles at Delhi.



Ice-container inserted in a can to keep the milk cool, at  
Government Military Dairy Farm.



River transport of milk by tamar at Haridwar.



Bamboo vessel used for milking in Assam.



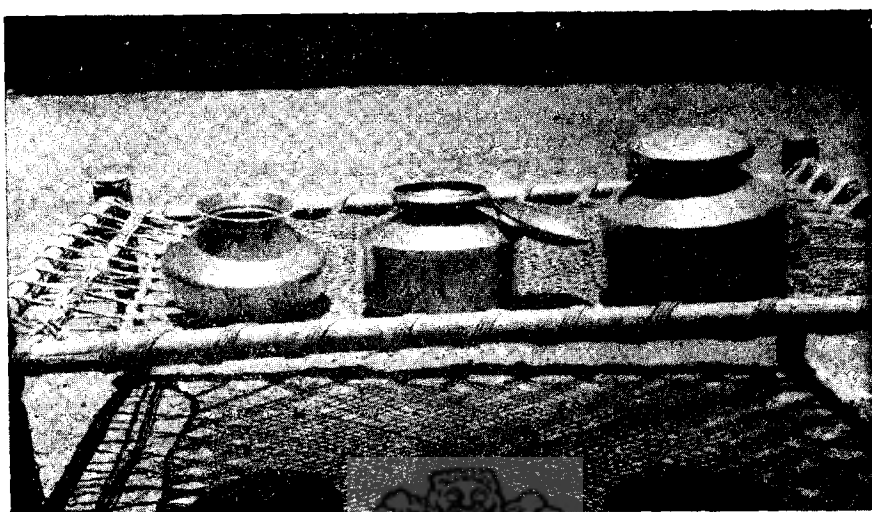
Vessels of brass used for milking, measuring and retailing.



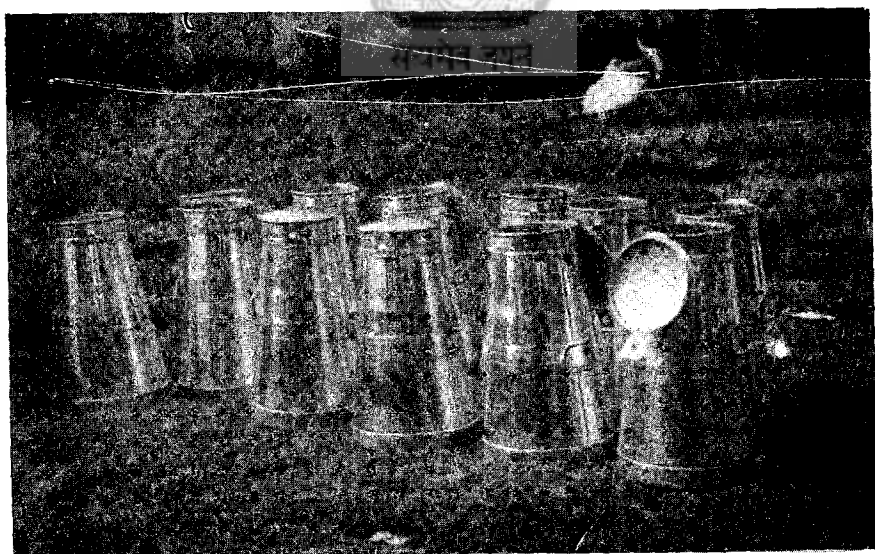
**Milk market held in the open at Rajkot (Kathiawar).**



**Earthen vessels used at Patna (Bihar) for retailing milk.**



Brass pots with lids used at a State farm in Kathiawar.



7 gallon milk and cream churns made at Anand.

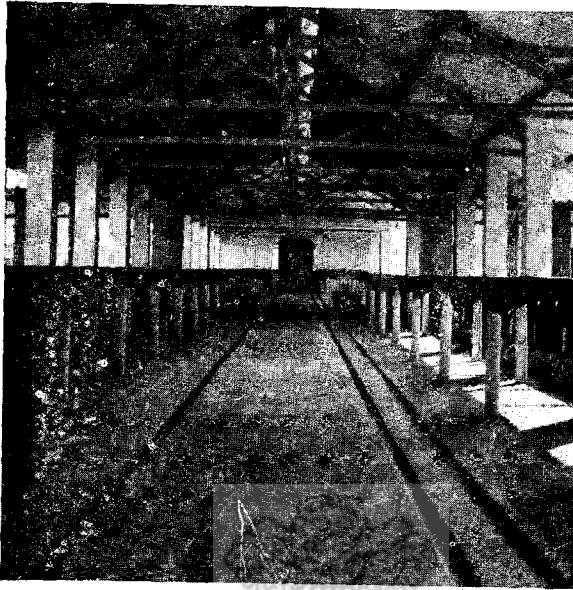




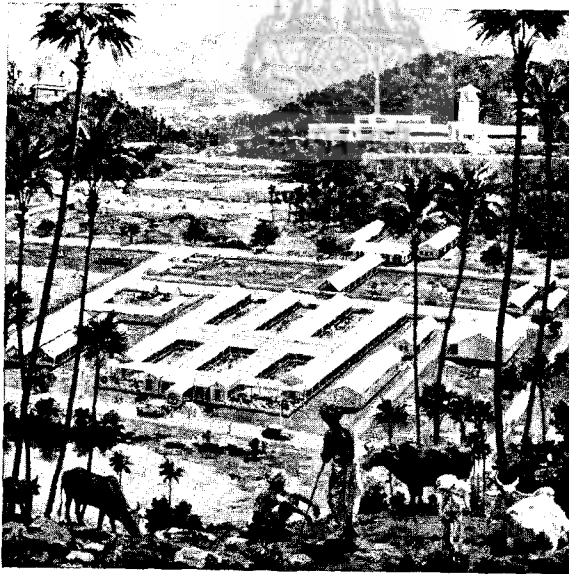
4 gallon milk and cream churns made at Anand.



Imported seamless cans used on farms.



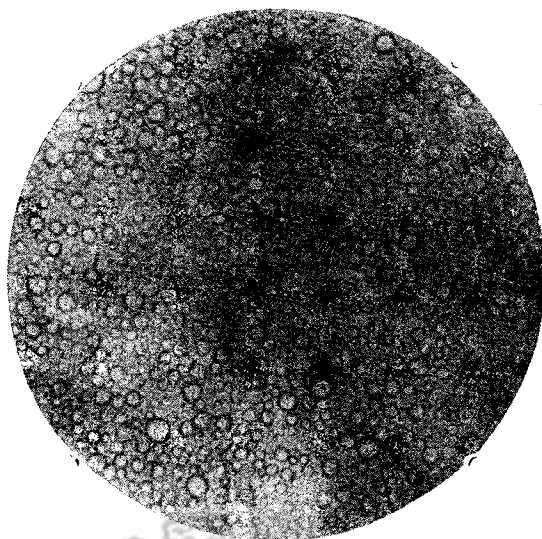
View of the cattleshed at the milk colony.



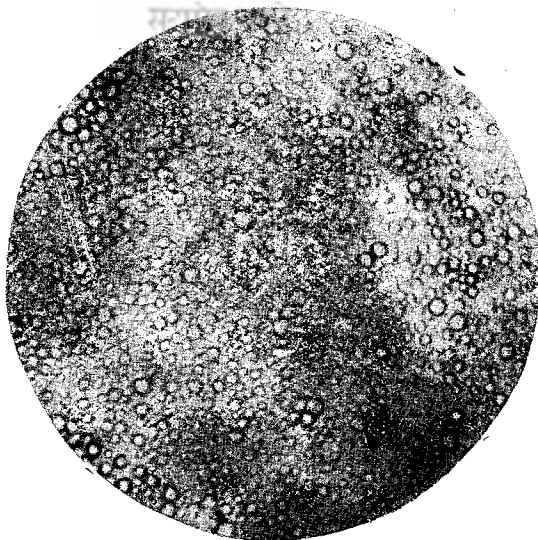
View of the Aare Milk Colony, Bombay.

*By courtesy of the Milk Commissioner, Government of Bombay.*

Facing page 129]



Fat globules in the milk of Sindhi cows.



Fat globules in the milk of Murrah buffaloes.



Plate I.—Weaning is seldom practised. If the calf dies, its raw skin is stuffed with straw as in the above picture and is brought to the cow at each milking. The milker is required to handle this unhygienic parcel several times during the milking. This practice is quite common all over the country.



Plate II.—Feeding and milking the animals from door to door for delivery of milk is common everywhere and is considered to be the best way of obtaining pure milk. The photograph was taken at Hubli (Bombay Province).



Plate III.—This is what the strainer cloth looked like after 60 lb. village milk had passed through it, at a rural collecting centre of a co-operative organisation where milking was done under supervision. Animals are rarely cleaned before milking.



Plate IV.—A corner of an enclosure where cows are kept in a Northern Indian town. Note the walls of the courtyard which are covered with dung cakes being dried for fuel. Milk produced under such surroundings can hardly escape contamination.



Plate IX.—Galvanised buckets, kerosene oil tins and narrow mouthed brass vessels are commonly used as milk containers. Note the flies on the vessels. The photograph was taken in an East Punjab town, and shows the sale of milk at a producer's holding.



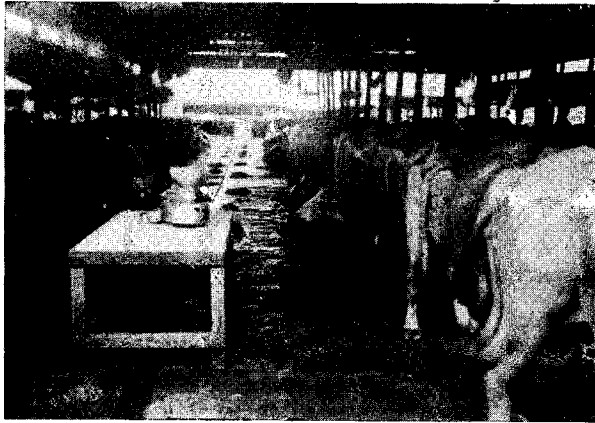
Plate X.—In all Northern Indian towns, milk remains uncovered throughout the day at shops on the streets. Note other vessels containing rabri and curd which are also uncovered.



**Plate VII.**—In West Bengal only a few village milk cans are provided with lids. Straw and leaves are used extensively to prevent spilling. This practice is universal even in places where cans have lids. Use of straw is said to prevent milk from churning.



**Plate VIII.**—A can of milk at the Calcutta milk market awaiting sales. Note the bathing and washing platform, the foot of the seller near the milk and the floating straw in it. The next stage of sale would be the dipping of hands and fingers to judge its quality.



**Plate V.**—One of the city stables at Bombay. Note inadequate size of drains, the manure covered table for keeping the milk vessels and the accumulation of dung.



**Plate VI.**—Earthen pots are still used for retailing milk in a province where the Food Adulteration Act prohibits the use of containers made of impervious material.



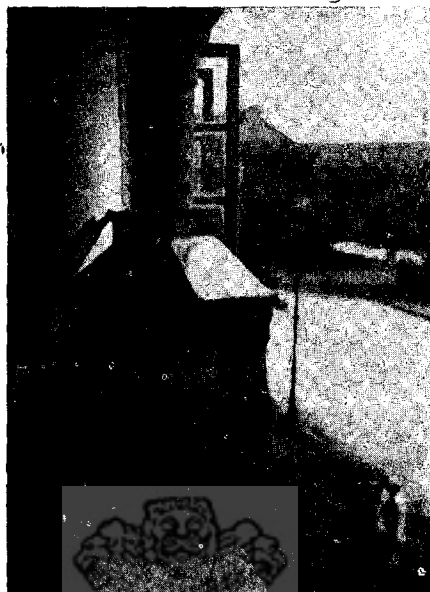


Plate XI.—This leaky can patched up with coal-tar was in use as a milk container before it was seized by the Health Department, Bombay. Soap, mud, pitch and tar are commonly employed for stopping leaks in milk cans.



Plate XII.—Milk for immediate drinking being served on road side from earthen vessels. Note the milk saucers kept on ground. This photograph was taken in a town in Saurashtra.



**A view of the Quality Control Laboratory.  
Bombay Milk Scheme.**



**Automatic weighing of milk at Toned Milk Dairy.  
Bombay Milk Scheme.**

*By courtesy of the Milk Commissioner, Government of Bombay.*

# BACTERIA IN FARM MILK AT DIFFERENT STAGES OF HANDLING.

<u>HOURS AFTER MILKING.</u>	<u>STAGE</u>	
-	IN MILKING PAIL.	6,800 PER c.c. OF MILK.
$\frac{1}{4}$	IN WEIGHING PAIL.	27,300 PER c.c.
1	IN 20 GALLON CHURN.	91,300 PER c.c.
2	IN BULKED MILK BEFORE PASTEURISATION.	225,000 PER c.c.
$2\frac{1}{2}$	AFTER PASTEURISATION.	9,400 PER c.c.
3	AFTER BOTTLING.	15,000 PER c.c.
18	IN RETURNED MILK.	121,000 PER c.c.

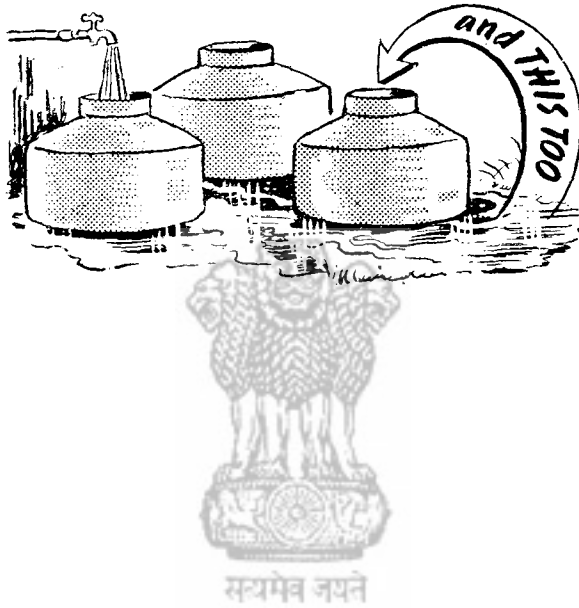


**Milking a Buffalo in one of the Bombay Stables.**

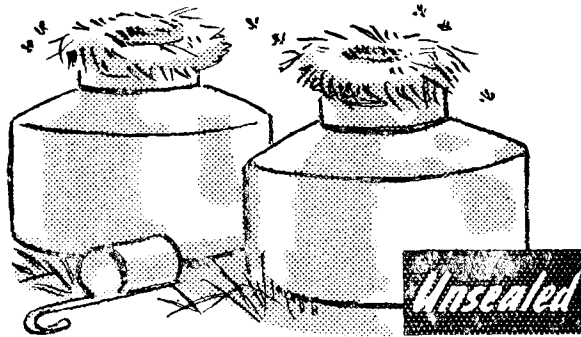


**Daily Toll of dead Calves at a Bombay Milk Stable.**  
*By courtesy of the Milk Commissioner, Government of Bombay.*

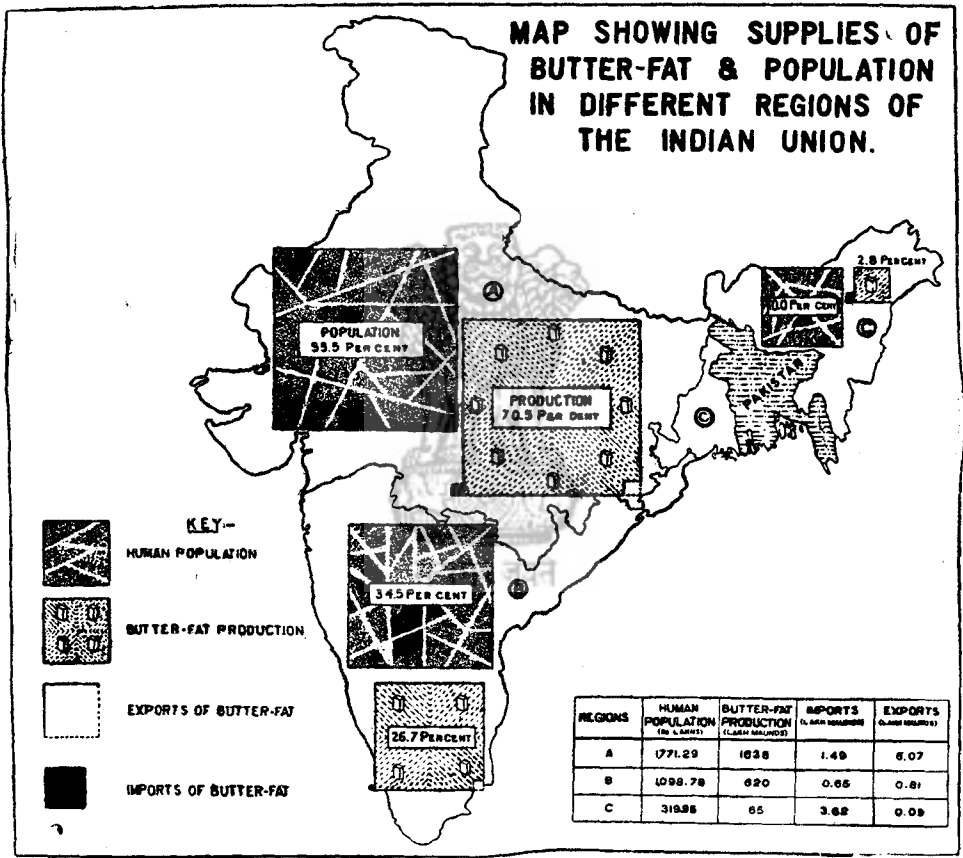
## LITTLE CHECK ON QUALITY



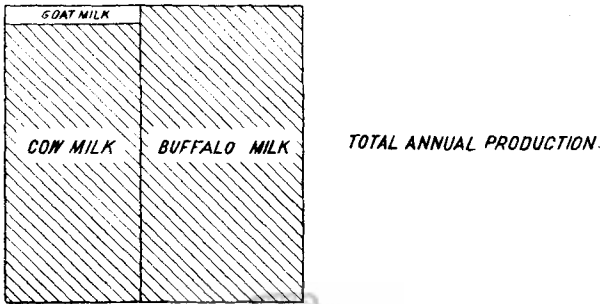
**UNCONTROLLED DISTRIBUTION**



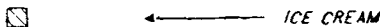
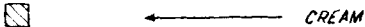
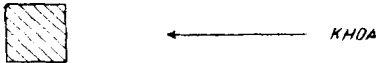
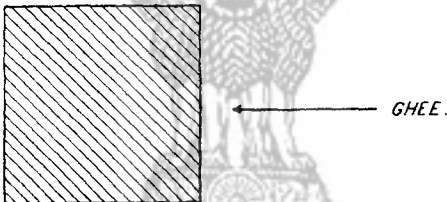
*By courtesy of the Milk Commissioner, Government of Bombay.*



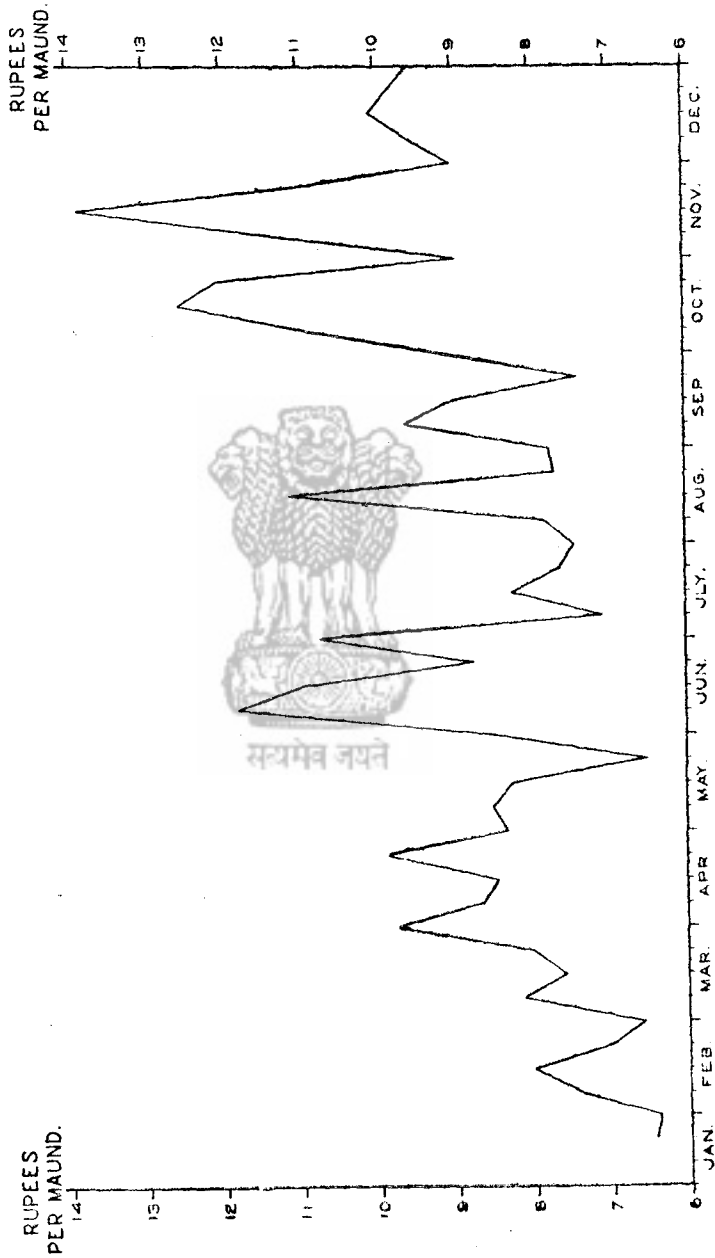
DIAGRAMMATIC ILLUSTRATION SHOWING  
THE ANNUAL PRODUCTION & CONSUMPTION  
OF MILK & MILK PRODUCTS



CONSUMED AS: —



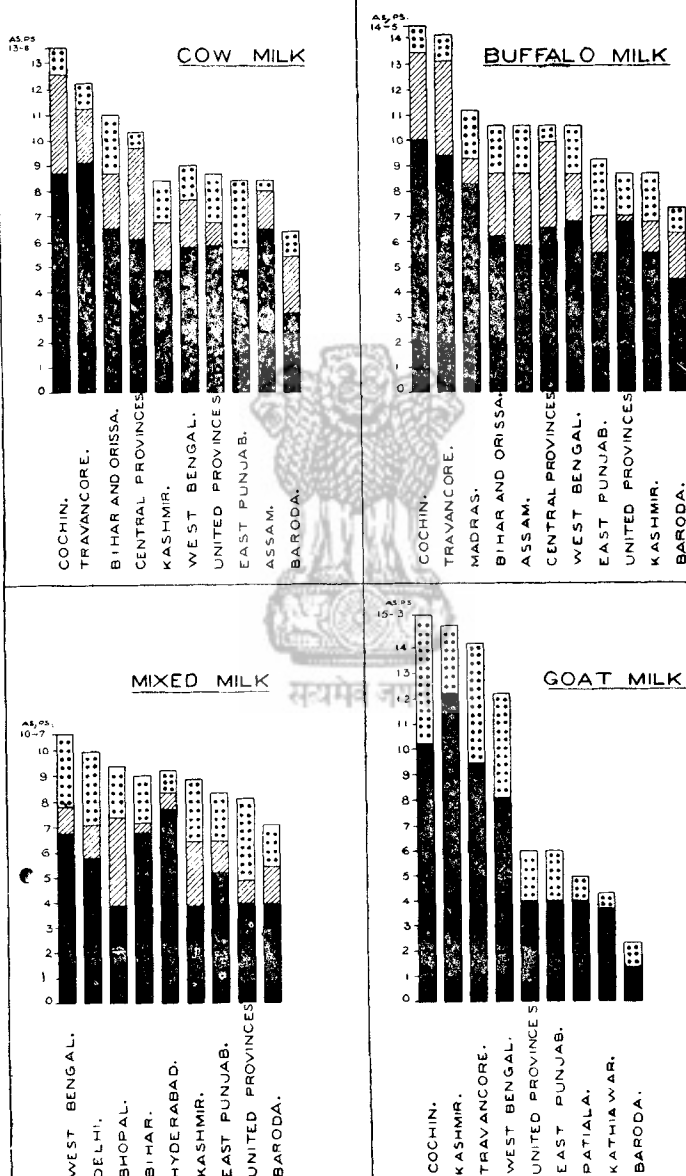
# WEEKLY PRICES OF UNCONTRACTED MILK AT BOMBAY DURING 1939.





## PRICE SPREADS IN DIFFERENT AREAS IN THE INDIAN UNION.

(ANNAS AND PIES PER SEER)

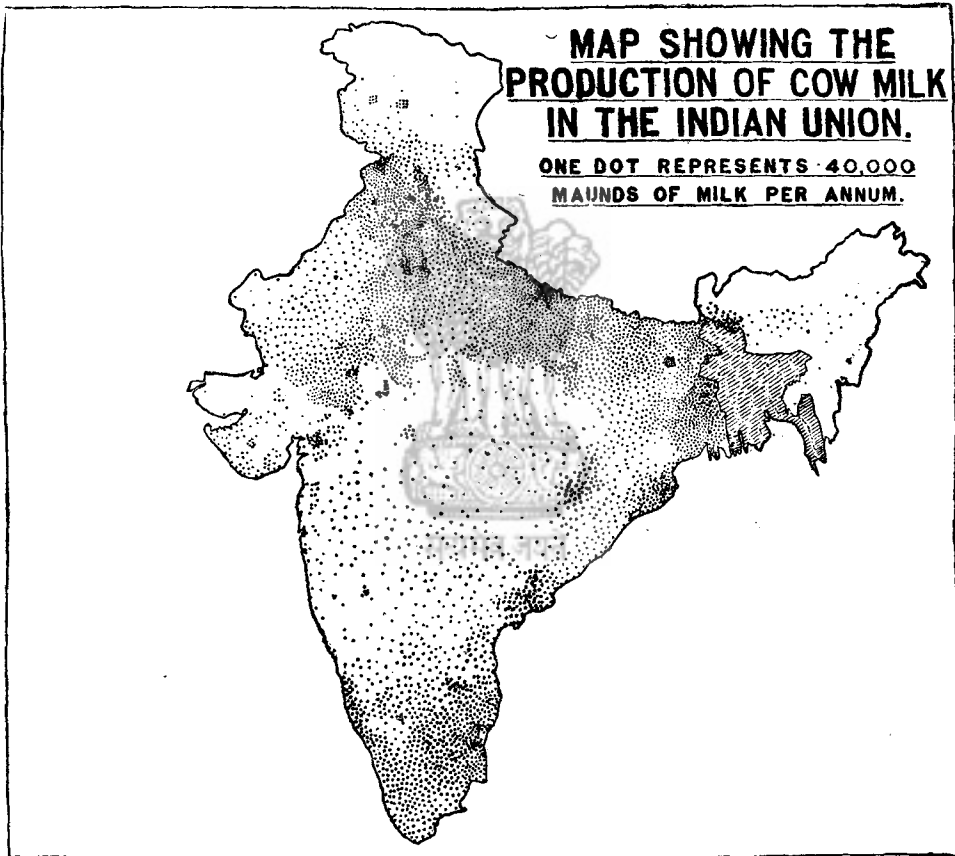


### REFERENCES:—

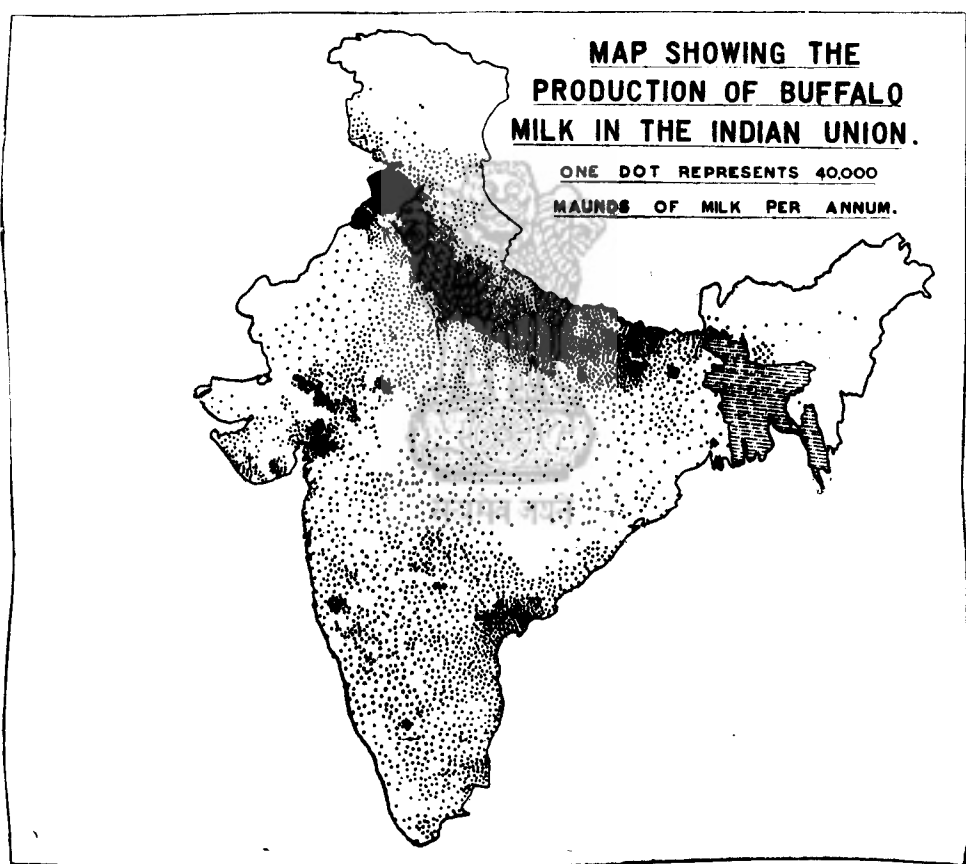
PRODUCER'S  
PRICE —

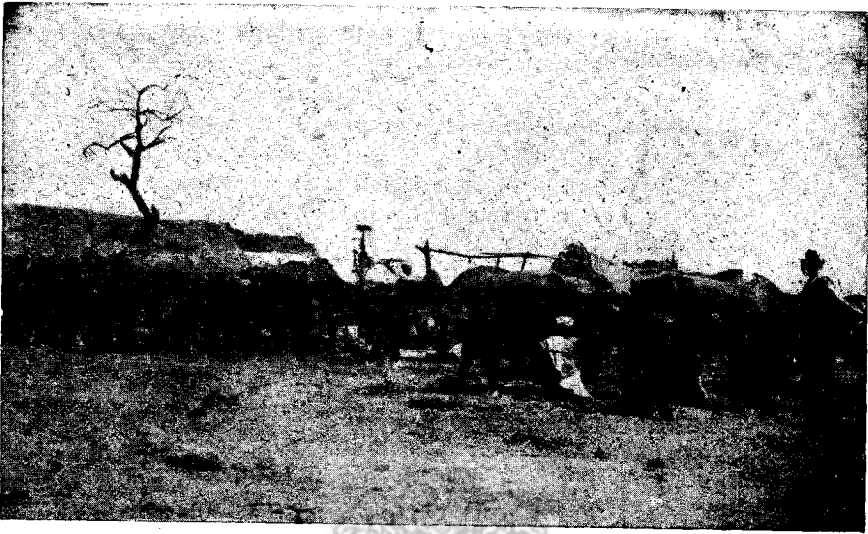
COLLECTOR'S  
MARGIN. —

RETAILER'S  
MARGIN. —

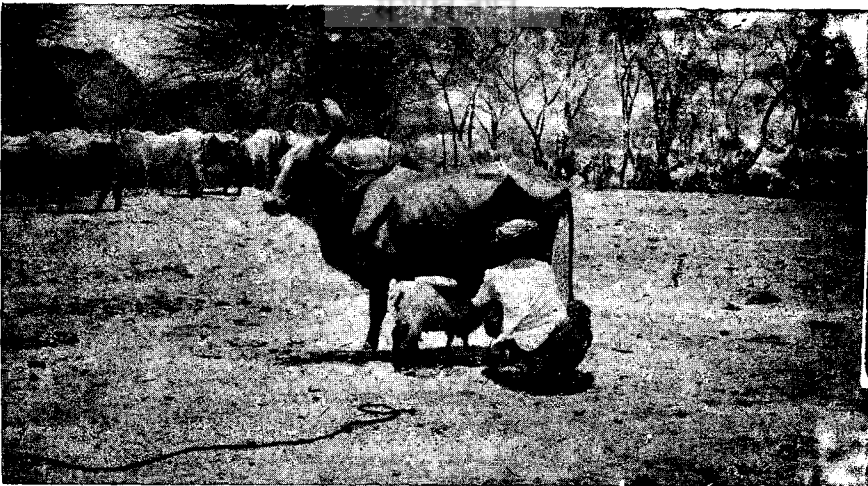


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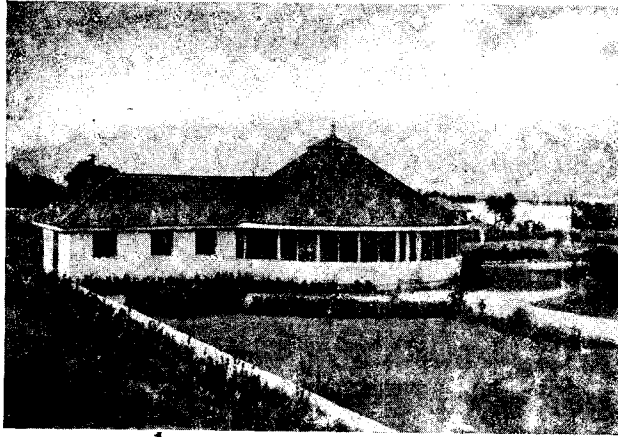


Milking in the open at a village in Junagadh (Saurashtra).



Milking in the open in Cutch.

NOTE—Aram is used in place of the calf which is dead.



Outside view of the state dairy at Srinagar (Kashmir State).



Modern milking byre of a private farm at Calcutta.

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AMA.21	Report on the Marketing of Potatoes in India and Burma. (Out of print)	Rs. 1-4-0 or 2s.
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[Continued from inside title cover]

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